

Ecological Perspectives on Utility of Thresholds for Weed Management

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Preface

During recent years there has been considerable emphasis on developing economic thresholds to use for weed management. This has been particularly true in Australia, Germany, England, and the USA.

A symposium was held to explore economic thresholds and their use in weed management at the 1987 annual WSSA meetings. One of the things that was noted by George Cussans, the lead speaker, was a caution that adoption of economic thresholds on a single-year basis might lead to long-term buildup of weed seed banks.

In recent years I have noted a few papers in which researchers have published data on weed density impacts on crops, coupled with weed seed production data, and predictions of long-term population dynamics. All these papers have questioned the use of economic thresholds (ET) for management of the weed/cropping systems studied.

I also note some questions being raised about the long-term implications of single-season thresholds by farmers in California with whom I come in contact. Wynette Sills, who farms about 730 ha (1800 A) with her husband using organic methods, wrote me a long letter explaining some of their weed management problems. I quote from her letter "For an organic production system, the ET time-line must encompass several years to address crop diversity within a rotation plan. . . . In an organic production system there is no 'rescue treatment' or quick acting pesticide to once again bring a pest population back down below a crop ET. Therefore, pest management decisions must be well thought out, because particularly with weeds you are forced to live/farm with the consequences for a long time". I could not have phrased this better, and it is obvious that Wynette has concerns about using single-season thresholds in their organic farming operation.

I have also discussed using economic thresholds with Mark Grewal, who is one of the section managers for J. G. Boswell Company, of Corcoran, California. J. G. Boswell Company farms about 50 600 ha (125,000 A) of intensive arable crops—cotton (*Gossypium hirsutum* L.), safflower (*Carthamus tinctorius* L.), wheat (*Triticum aestivum* L.), seed alfalfa (*Medicago sativa* L.), and to a lesser degree various vegetables. I asked Mr. Grewal if they would consider using thresholds; the answer was an emphatic "no". When I asked why, his response was "our economic analyses indicate that it would be more costly than our current policy". That policy is to not let weeds set seed! The two examples used above perhaps represent extremes in weed management. Application of economic threshold weed management may be appropriate in lower value cash crops that require relatively short weed-free periods and where many remedial control options are available. However, the costs associated with increases in the weed seed bank are poorly understood and will almost certainly reduce threshold weed densities.

It is now clear that we do not know enough about the factors that regulate weed seedbank dynamics. It will only be when we have determined seedbank loss rates that we will be able to improve our predictions of seedbank longevity and thus determine economics of management strategies that alter seedbank dynamics.

With these concerns a group of weed scientists was assembled to discuss the implications of weed economic thresholds in relation to weed population biology. The papers that follow assess theoretical aspects of weed population dynamics placed into a threshold management philosophy, discuss the development of a specific economic threshold model, and review the implications of spatial and temporal weed population dynamics in relation to resistance management. Three case-history papers discuss actual attempts to link economic thresholds to seed production and seedbank demography. Papers by Maxwell and Gherza and by Bauer and Mortensen, submitted to *Weed Technology* at the time of the symposium, have been included in place of that presented by Dr. Anne Légère, whose paper has been published elsewhere.

Symposium organizer,
Robert F. Norris, Chairman

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