

SURVEY OF WEED PROBLEMS OF THE NORTH COAST OF NEW SOUTH WALES

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ABSTRACT

*A survey of weed problems was made by means of a questionnaire submitted to selected farmers on the north coast of New South Wales. A weed problem was reported on 88% of respondents' farms and bracken (*Pteridium esculentum*) and crofton weed (*Eupatorium adenophorum*) were reported to be the major weeds. Control of these weeds by cultivation is often difficult because they frequently occur on steep land which is inaccessible to tractors. Costs of control must be related to the low quality pasture which is developed.*

INTRODUCTION

A survey was made of weed problems on the north coast of New South Wales in early 1970. Its object was to provide information on which to base future decisions regarding the weed research programme in the area. The survey was made by the distribution by mail of a questionnaire, which was designed to determine the nature and extent of weed problems as defined by dairy farmers and graziers in the North Coast Agricultural Region in New South Wales which extends from Kempsey to the Queensland border. It consisted of a survey of a random sample of farmers and a survey within two farmer organisations.

METHODS

Survey of a random sample of farmers

A single page questionnaire was distributed to 5% of farmers on the north coast. The questionnaire asked farmers whether or not they had a weed problem and if so, whether the problem was a specific weed or a number of different weeds in a particular situation (e.g. in improved pasture), or some combination of both. Farmers were asked to describe their problem and indicate whether they were using any control methods, and if they were achieving success in their efforts to overcome their problem.

Techniques most likely to give a high response as described by Freebairn (1967) were employed. The questionnaires were printed on yellow paper and sent with an accompanying letter of explanation and a return stamped addressed envelope. The questionnaire was pre-tested and a 50% response was obtained, which was considered satisfactory.

The sample, totalling 400 farmers, was stratified over Pasture Protection Board areas and sub-divisions within those areas. Names were selected from Pasture Protection Board lists using random numbers. Data from returned questionnaires were transferred to punch cards.

Survey within two farmer organisations

Two farmer organisations, the Agricultural Research Councils and the Graziers' Associations were contacted at half-yearly and annual district meetings. Representatives of each branch of both organisations (11 and 10 branches respectively) agreed to complete and return twenty questionnaires. The questionnaires were the same as those used for the random sample survey. They were intended to be regarded as replies from "proven respondents" and examined separately from the random sample. A total of 420 questionnaires were distributed by post to the secretary of each branch of both organisations with a letter of explanation.

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RESULTS AND DISCUSSION

Random Sample

A 48% response was obtained and an additional 3% were returned as dead letters. This compares favourably with the initial response in other surveys including those made among proven respondents (Dillon and Jarrett 1964). The possibility of non-response bias is the most important limitation in mail surveys of this type. However, a study of the problem in one survey by Freebairn (1967) showed that, in general, differences between respondents and non-respondents are attributable to chance alone. He concluded that "if returns to the mail questionnaire are relatively high, the answers from respondents can be used to obtain unbiased estimates of the population parameters from which the sample was drawn".

The importance of the use of follow-up reminder mailings to obtain maximum response has been stressed (Freebairn 1967), but the surveys referred to by Freebairn sought answers to objective questions which required little or no decision making or formulation of opinion on the part of respondents, for example wheat acreage or average yield. In this survey, in which subjective replies were sought, it was considered that the use of mailings would induce a high proportion of "forced replies" and bias the results of the survey towards indication of an apparently greater number of weed problems than, in fact, exist.

The total number of respondents was 196, of which 24 stated that they did not have a weed problem. Of the 172 who did have a problem, 153 were using control methods and 138 were achieving some success in overcoming their problem. The problems were divided initially into the three types described on the questionnaire:

	<i>Respondents</i>
(i) Specific weeds	108
(ii) Weeds in a particular situation	31
(iii) Both (i) and (ii)	33

Following an examination of respondents' descriptions of their problems, types (ii) and (iii) were combined and re-subdivided as follows:

	<i>Respondents</i>
(iv) Weeds in unimproved pasture	28
(v) Weeds in improved pasture and cultivation	19
(vi) Weeds in other situations	17

Table 1 gives a list of specific weeds which were considered to be problems by at least two respondents, expressed as a percentage of the total response.

TABLE 1
*Specific weeds considered to be problems by at least two respondents
expressed as a percentage of the total response*

Common Name	Scientific Name	Percentage of Total Replies
Bracken	<i>Pteridium esculentum</i>	15%
Crofton weed	<i>Eupatorium adenophorum</i> (possibly also includes some <i>E. riparium</i> , mist-flower)	8%
Lantana	<i>Lantana camara</i> sens lat. common pink and common red	} each species 2-4%
Annual ragweed	<i>Ambrosia artemisiifolia</i>	
Noogoora burr	<i>Xanthium pungens</i>	} each species 1-2%
Broomsedge (whisky grass)	<i>Andropogon virginicus</i>	
Variable groundsel (fireweed)	<i>Senecio lautus</i>	} each species 1-2%
Cotton bush (narrow-leaf cotton-bush)	<i>Asclepias physocarpa</i>	
	(red-head cotton-bush) <i>Gomphocarpus physocarpus</i>	} each species 1-2%
Lesser swinecress (carrot weed)	<i>Coronopus didymus</i>	
Smartweed	<i>Polygonum hydropiper</i>	} each species 1-2%
Nut-grass	<i>Cyperus rotundus</i>	
Water hyacinth	<i>Eichornia crassipes</i>	

Fourteen other weeds were each mentioned by only one respondent.

Most farmers with a problem regarded specific weeds as their major problem. Bracken was considered to be the most important weed in all Pasture Protection Board areas on the north coast.

It is remarkable that where such a diversity of environmental conditions and species exist, 23% of all respondents regarded two species, crofton weed and bracken, as their major problem. These were also mentioned in two thirds of those replies classified as type (v), weeds in unimproved pastures.

Thirty-three per cent of farmers with a problem involving a specific weed mentioned the fact that part of their difficulty in controlling weeds was due to the steepness of the land on which the weeds occur. Thirty-six per cent of farmers with a bracken problem mentioned steep land as part of the difficulty in overcoming their problem.

Farmer Organizations

The response from these organisations was poor. A thirty-three per cent response was received from the Research Councils and a 10% response was obtained from the Graziers' Associations after four months. Since no replies were received from some branches, a representative sample was not obtained.

In general, the problems referred to by these farmers were general weeds in pasture. Few farmers had no problem. Bracken was a common "specific weed" problem but because of the small sample size reliable conclusions cannot be drawn.

The low response from these farmers may indicate a lack of concern regarding weeds in comparison with other problems. The fact that few of those who responded had no weed problems may be indicative of this. Some farmers may correctly interpret their apparent weed problems as problems relating to pasture establishment or management.

Table 2 compares the distribution of answers to the same four questions from the Research Councils ("Observed") to that from the random sample ("Expected"), the figure given for each answer being expressed as a percentage of total replies. A chi-square test indicated that the sample from the Research Councils could not be regarded as a sample of the whole farmer population (on the assumption that the random sample was representative).

TABLE 2
*Reply Comparison between Research Councils ("Observed") and
Random Sample of Farmers ("Expected")*

Problem Type	"Observed" Percentage	"Expected" Percentage
1. No Problem	4	28
2. Specific Weed	33	45
3. Specific Situation	51	13
4. Both 2 and 3	12	14

$$\chi^2 = 135.13; p < 0.001$$

GENERAL DISCUSSION

Respondents defined bracken as the most important weed problem on the north coast of New South Wales. This ubiquitous plant, like crofton weed, is common on steep land, which is inaccessible to wheel tractors.

Although bracken can be controlled by ploughing and pasture improvement, many farmers do not wish to embark on such a programme, particularly where land is steep. Many landholders wish only to retain the limited carrying capacity of their naturalized grass dominant pastures by removal of bracken and allowing grass to volunteer in its place. Since the grass species most commonly involved is the relatively low producing *Axonopus affinis*, any method of bracken removal must be inexpensive to be economical. However, no inexpensive method of bracken removal is yet known.

Crofton weed has been the subject of a detailed research programme by the author (Auld 1969, 1970a, 1970b) and recommendations for its control are soon to be distributed to farmers. It, too, is a weed of unimproved pastures and can be controlled by improved pasture where the practice is economically feasible.

The other weeds referred to cannot be regarded as significant problems in comparison with bracken and crofton weed. Only in some limited areas of the north coast do any of these assume problem status.

Groundsel bush, *Baccharis halimifolia*, which occupied 0.9% of the Richmond-Tweed region in 1967 (Auld 1969), was not recorded by respondents as a problem. Farmers find the plant easy to control and the work of the Far North Coast County Council has kept it in check and reduced its area of occurrence within the region. However, the author has observed large areas of this and another noxious plant, crofton weed, on land held by the Forestry Commission of New South Wales.

Weed problems in specific situations which were cited by farmers, although mainly problems in pastures, were extremely varied in type, ranging from lesser swinecress in irrigated clover to variable groundsel in kikuyu. There is no single major problem of this type on the north coast, other than a general problem in unimproved pastures.

CONCLUSION

The major weed problems on the north coast of New South Wales involve perennial weeds, particularly bracken, in unimproved pastures. These problems can be overcome by pasture improvement if establishment is satisfactory. However, the intensive development of much of the land involved, which is generally relatively low in value, may not be economically sound. The solution to the problem could lie in the successful management of *Axonopus affinis* pastures.

The value of *Axonopus affinis* pastures on semi-arable land should be quantitatively evaluated under several conditions and management techniques investigated before consideration is given to the advisability of limited development in the form of removal only of perennial weeds from these pastures. It is only after this evaluation has been made that consideration of techniques of bracken removal could take place.

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