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THE OPERATION OF COORDINATED RABBIT CONTROL ORGANIZATIONS IN ENGLAND AND WALES

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ABSTRACT: Rabbit control organizations in England and Wales were studied between 1978 and 1982. A national survey of existing organizations showed that there were 2 types (societies and groups) and that they jointly covered only 2% of farmers and 1.5% of agricultural land. Three societies were studied for 3 years and were found to be underfunded and increasingly unable to provide coordinated control on adjoining properties. Farmers are provided with recommendations on how to run coordinated rabbit control organizations.

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INTRODUCTION

The European wild rabbit (*Oryctolagus cuniculus*) has been increasing in numbers in recent years throughout Britain (Trout et al. 1986), due mainly to a waning in the effects of myxomatosis (Ross and Tittensor 1986). It is now considered to be the major vertebrate pest of British agriculture, causing damage estimated to cost tens of millions of pounds each year (Rees et al. 1985).

The effect of rabbit control on any one farm is often short-lived because reinfestation occurs from neighboring areas. Longer-lasting results can be achieved by coordinated control on adjoining areas. In a study in Australia (Rowley 1968), rabbit numbers were reduced for 18 months when control was conducted over the entire study area compared to only 6 months when control was limited to parts of the area. In both of these cases, a 95% reduction in rabbit numbers had been initially achieved. Rowley (1968) considered that reinfestation explained why the lasting effects of control were shorter when the area of control was limited. Coordinated control by Pest Boards has been one of the main reasons for the significant reduction in rabbit numbers achieved in New Zealand since the 1950s (Thompson 1958, Williams 1984).

In Great Britain in 1958 the Government introduced the rabbit clearance society scheme, awarding a grant of 50% to societies towards coordinated rabbit control costs. During the mid-1950s, an estimated 99% of the rabbit population had been killed by the virus disease myxomatosis (Lloyd 1970) and the scheme was seen as a means of trying to maintain at a low level or even further reduce rabbit numbers.

The number of societies increased until 1964 when 750 were operating. Forty-six percent of all agricultural land (6,000,000 ha) was included within the parishes (subdivisions of English and Welsh counties) in which these 750 societies operated but, because many farmers in these parishes did not join societies and because many who did join did not subscribe all of their land, only about half of this area (3,500,000 ha) was actually subscribed to societies for rabbit control. The number of societies then gradually decreased

until 1971 when grant aid was withdrawn and the number rapidly decreased within that year from 550 to 280.

A number of rabbit control organizations have been formed since 1971 and are referred to in this paper as rabbit action groups. They are treated separately from societies because, compared to societies, groups conducted rabbit control on all the agricultural land within their areas of operation, involved fewer farmers and were better financed.

Since the recent increase in rabbit numbers is likely to accelerate (Ross and Sanders 1987), it is even more necessary to provide farmers with recommendations on how to establish and run a coordinated control organization. To provide a sound basis for these recommendations, a study of existing organizations in England and Wales was conducted between 1978 and 1982. This consisted of a national survey and a detailed examination of three societies. The results of the study and the recommendations arising from it are reported in this paper.

METHODS

National survey

Questionnaires were sent to Ministry of Agriculture, Fisheries and Food (MAFF) advisers throughout England and Wales to determine the number of organizations and obtain the following information on each: type (society or group); location; number of members; area (ha.) of subscribed land; methods of fund-raising and the costs (£) to members; the number of operators and their period of employment; and methods of rabbit control.

The extent of organized rabbit control throughout England and Wales was determined by comparing the number of members and area of land covered by these organizations with the national number of farmers and area of agricultural land, obtained from a MAFF census conducted in the year of the survey.

To test the hypothesis that rabbit control organizations are more numerous in those parts of the country where rabbits are more abundant, the results of a survey (Trout and Tittensor 1983) of rabbit abundance in England and Wales were

used. This survey grouped counties into 7 categories according to their level of rabbit abundance, giving a value of 7 to that category of counties where rabbits were most abundant and 1 where they were least abundant. For these 7 categories, the correlation between the mean numbers of control organizations/county and the values allocated by Trout and Tittensoor was examined by Spearman's rank test.

The 3 societies

Three rabbit clearance societies (A, B & C) were selected as a representative sample of those remaining in England and Wales and were studied for 3 years. The following information was obtained from the management of each society: number of members; area (ha) of subscribed land; number and period of employment of operators; methods of fund-raising and charges (£) to members; composition of the management committee; salaries of members of the management committee and of operators; annual figures of income and expenditure; and the methods of organizing and recording control operations.

Visits were made to all members of Societies A and B who were willing to be interviewed and to a random sample of those of Society C to obtain details of the area and location of land which was subscribed for control. The area of land subscribed to each Society was calculated as a percentage of the total available within the parishes in which each Society operated using data from a MAFF census. The locations of farm boundaries were plotted on large-scale maps.

Farmers within the parishes in which each Society operated who were not Society members were visited to discuss their reasons for not joining. These farmers were chosen at random from those whose farms were adjacent to members' farms. In each area at least one of these non-members was interviewed for every 4 members who were interviewed.

Surveys to find rabbit signs (burrows, scrapes, runs and grazing) were conducted on all the farms of interviewed members and non-members, with the exception of those of interviewed members of Society A where a random sample was surveyed. The surveys, carried out in winter and spring, were conducted along all field boundaries and through all woodland. Grazing of arable crops was considered to have caused a loss of yield at harvest when all the plants in any area of at least 0.01 ha. had been eaten.

Information on control methods and problems was obtained from the management committees and by accompanying operators on a number of control operations. The choice of method and the operators' expertise in the application of that method were assessed during all of these operations. Effectiveness of control was assessed at some of these operations by carrying out either 3 or 4 counts of rabbit numbers 2 weeks before and again after control. Counts were made on foot along a predetermined route either at night with the aid of a spotlight and binoculars or at dawn or dusk with the aid of binoculars only. T-tests were used to compare numbers counted before and after control in order to determine if rabbit numbers had been reduced.

RESULTS

National survey

Sixty-two societies and 13 groups (Fig. 1) were identified, but data on the number of members and area of subscribed land were available for 59 societies and 12 groups (Table 1).

Data on funding methods and charges were available for 57 societies and 13 groups (Table 2). Most organizations charged members a fixed rate per hectare of subscribed land. The majority of these charged a single rate but some charged different rates for arable land, woodland and moorland. Groups charged higher rates than societies. Other fund-raising methods used were annual subscriptions, with all members being charged the same subscription regardless of the area of their farms, and hourly charges for operators' time. Where no funds were raised, either the members provided labor to conduct control or the organizations were funded by the estates on which they were centered.

Data on employment of control operators were available for 60 societies and 6 groups (Table 3). All societies and groups with temporary operators employed them during January and February but by July only 54% of societies and 33% of groups were still employing them. In order to conduct control on all subscribed land twice a year, considered to be the minimum desirable aim, permanent operators of societies and groups would have to cover mean areas of 22 (6-70) and 16 (10-20) ha, respectively, each working day and temporary operators 50 (4-216) and 54 (10-110) ha, respectively. However, it is considered unlikely that more than about 40 ha. a day could be covered in practice. At that rate 30% of the societies, all but 4% employing temporary operators, and 40% of groups, all employing temporary operators, would be unable to conduct rabbit control twice a year on all subscribed land.

Information on control methods was available for all organizations. Burrow fumigation, which involved placing in burrow entrances a sodium-cyanide based powder which generates hydrogen cyanide gas when exposed to moisture, was the main method used by societies (61%) and groups (69%); using ferrets (*Mustela furo*) to drive rabbits from their burrows either into nets or to be shot was the only other method used to any extent by both societies (26%) and groups (23%).

Together societies and groups involved only 2.0% of farmers and 1.5% of agricultural land in England and Wales. These organizations were not more numerous ($P > 0.05$) in those parts of the country where rabbits were more numerous (Fig. 1).

The 3 societies

There was considerable variation among the 3 societies in the number of members, area of subscribed land, the number of operators and their period of employment, and charges to members (Table 4). However, all 3 used the same main fund-raising method which was to charge a single, fixed rate for each hectare of subscribed land. Each charged a higher rate initially to ex-members who rejoined, in order to

Table 1. The number of each type of coordinated rabbit control organization, the number of members and the area of subscribed land in the study conducted between 1978-1982 in England and Wales.

Organization	No.	Members			Area subscribed (ha)		
		Total	Mean	Range	Total	Mean	Range
Societies	62	3585 ^a	61	3-350	134,000 ^a	2,300	370-6,500
Groups	13	207 ^b	17	6-40	30,000 ^b	2,300	400-4,900

^aBased on data for 59 societies.

^bBased on data for 12 groups.

Table 2. Methods of fund raising and mean rates/ha (£) of coordinated rabbit control organizations in the study conducted between 1978-1982 in England and Wales.

Organization	Single Rate/ha. (N) ^a	Different rates (£/ha)					
		Arable (N)	Woodland (N)	Moorland (N)	Annual (N)	Hourly (N)	
Societies ^b	0.54 (37)	0.52 (17) ^c	0.93 (17) ^c	0.25 (5) ^d	10.62 (4) ^e	2.20 (3)	
Groups ^f	1.89 (3)	1.01 (3) ^c	1.90 (3) ^c		20.00 (1)	NA ^g (1)	

^aNumber of each type of organization using that method.

^bBased on data for 57 societies.

^cAll those charging an arable rate also charged a woodland rate.

^dAll those charging a moorland rate also charged arable and woodland rates.

^eAll those charging an annual subscription also charged a single rate.

^fBased on data for 13 groups.

^gData not available.

Table 3. The number of coordinated rabbit control organizations employing operators on a permanent and temporary basis, the number of operators employed and the duration of temporary employment in the study conducted between 1978-1982 in England and Wales.

Organi- zation	Permanent ^a			Temporary			Duration ^b	
	No.	Mean	Range	No.	Mean	Range	Mean	Range
Societies ^c	26	1.0	1-3	34	1.7	1-6	105	30-175
Groups ^d	3	1.0	1	3	1.0	1	68	50-100

^a>200 working days/year.

^bWorking days/year.

^cBased on data for 60 societies.

^dBased on data for 6 groups.

discourage members from leaving after rabbit control had been conducted, and a minimum fee to members subscribing small areas of land (10-40 ha.).

Each of the 3 Societies was managed by a chairman, a secretary and a committee of up to 7 members. However, each relied considerably on one official who had held his post almost since the Societies had been formed in the early 1960s and who was responsible for the daily running of each. The

chairman of Society C also acted as a field manager, supervising the operators and resolving difficulties between the operators and members.

The Secretary of each Society was the only paid member of the management committees and received a small annual salary (£500-£1,200). The operators were paid a weekly salary of £50-£58, when the minimum that was recommended for the lowest grade of agricultural worker in England and Wales was £58. Only Society B covered its costs effectively during all 3 years and at the end of the study had accumulated reserves of about £9,000. Expenditure exceeded income in one of the years for Society A and in 2 of the years for Society C and, at the end of the study, these Societies had reserves of only about £1,000 and £2,500, respectively. However, increases in the subscription rates were strongly resisted by members of each Society and, consequently, managements usually had to compromise by setting rates each year at levels lower than was considered necessary to meet rising costs. Each Society raised additional funds by conducting control for non-members for which a higher rate was charged, but these additional funds accounted for only a small amount (2-13%) of annual income.

A programme of visits to members by the operators was planned by the managements of Societies A and C but by the operators themselves of Society B, the latter being an unsatisfactory arrangement causing difficulties because the management was largely uninformed of the detail of the pro-

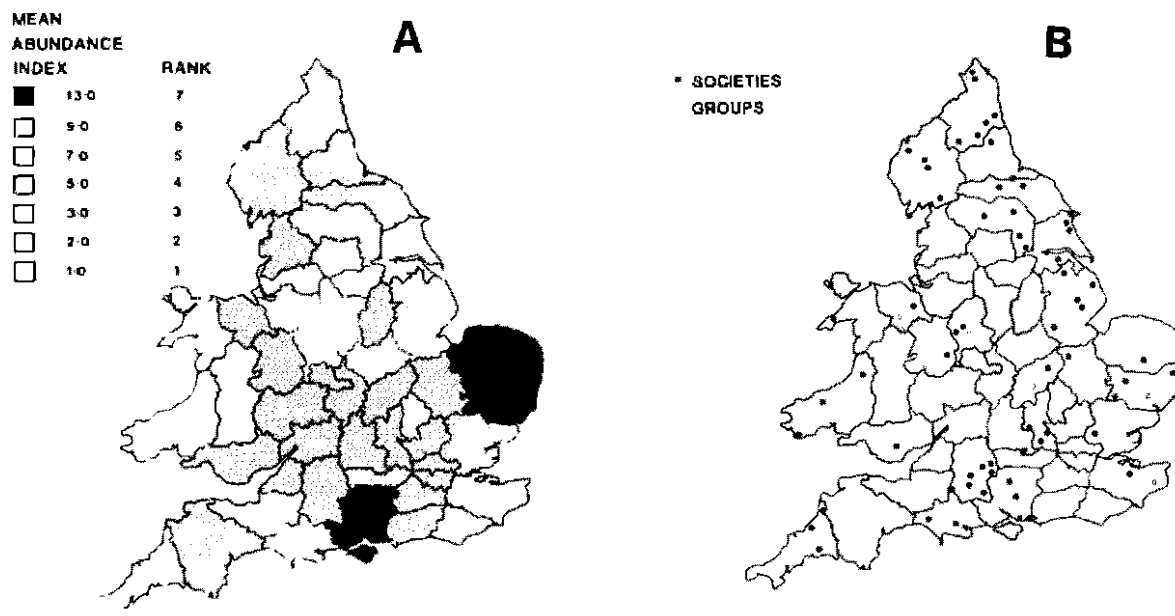


Fig. 1. (A) Rabbit abundance (Trout and Tittensor 1983) and (B) the location of coordinated rabbit control organizations, in England and Wales in 1982.

Table 4. The number of members, area of subscribed land, subscription rates and the number of permanent and temporary operators of the 3 Rabbit Clearance Societies studied between 1978-1982 in England.

Society	Members	Area (ha.)	Subscription (£/ha)	Operators	
				Perm.	Temp.
A	51	5,389	0.25	0	1
B	91	11,568	0.33	2	1
C	144	15,919	0.20	3	0

gramme. A record of control operations conducted on members' land was kept by the management of Society A only. This record included a form which gave details of the rabbit control conducted requiring signature by the member. This avoided the frequent difficulties experienced by the other 2 Societies when members claimed that their farms had been omitted from the programme.

Many (20-50%) interviewed members (Table 5) subscribed only part of their farm, mainly because they considered that there were too few rabbits on the remainder to justify the expense. The area of land subscribed to Societies A, B and C was 14, 22 and 66% respectively, of the total available within the boundaries of the parishes in which they operated whereas if members had subscribed all of their land, the area subscribed would have been about 55, 50 and 80% respectively. About 50% of the farms subscribed to Societies A and B and 30% of those subscribed to Society C were either

Table 5. The number of members and adjoining non-members interviewed of the Rabbit Clearance Societies studied between 1978-1982 in England.

Society	Members	Non-members
A	51	15
B	88	24

completely isolated or adjacent to only one other subscribed farm.

Most (54-93%) non-members (Table 5) that were interviewed knew of the existence of their local Society but did not think that it would be cost-effective to join. Only a few (3-7%) had been members at one time, but no common reason was given for withdrawing.

Signs of rabbits were found on over 90% of both members and non-members' farms surveyed in all 3 areas. In particular, severe enough grazing of arable crops, considered to have caused a loss of yield at harvest, was found on 15-30% of members' farms and on 25% of non-members' farms. On the farms of members of Societies A and B, 65% of all cases of severe grazing appeared to be caused by rabbits coming from burrows on non-members' land. However, on the farms of members of Society C, only 15% of all cases of severe grazing appeared to be caused by rabbits coming from non-members' land. On non-members' farms, 40% of all cases of severe grazing appeared to be caused by rabbits coming from adjoining land.

The main methods of control used by operators were largely determined by Society policy rather than by field conditions. Societies B and C used ferreting whereas Society A used burrow fumigation also. All the operators appeared to be expert at ferreting but not at burrow fumigation. However, at those control operations where effectiveness was assessed, rabbit numbers were reduced ($P < 0.05$) in only one of the 8 where ferrets were used (reduction: 40%) but in 3 of the 5 where fumigation was used (reduction: 61-75%). As the aim of each Society was to control rabbits on all subscribed land twice a year, the operator of Society A would have had to treat about 65 ha. each working day while those of Societies B and C 40 ha; the operator of Society A did not achieve this aim.

Control operations were hindered on farms where game species, usually pheasants (*Phasianus colchicus*) were reared for sport. Some of the members (11-19%) that were visited in each Society restricted either the timing of rabbit control to the closed season (February-August) of the pheasant, or the method of control to ferreting using nets only, or both.

DISCUSSION

Since 1971, the number of societies in England and Wales has been reduced by 75% and very few groups have been formed. The main reason for the continued operation of the 3 Societies was the enthusiasm of the long-standing chairman or secretary. If this was also the main reason for some of the other remaining societies, it would explain the lack of correlation between numbers of control organizations and rabbit numbers.

Societies A and B were not really conducting coordinated control because about 50% of subscribed land was isolated from that of other members. Consequently, most of the severe grazing identified on their members' farms was caused by rabbits coming from burrows on non-members farms. This isolation had been caused by a loss of about 50% of the land subscribed to each of these two Societies since their formation. In England and Wales in 1964, the mean area subscribed to each society was 4,600 ha. but by the time of this study it had fallen, also by about 50%, to 2,300 ha. Therefore, if the effects on Societies A and B of this loss are representative nationally, many of the remaining societies probably also contain numerous isolated farms and will be unable to conduct effective coordinated control. By contrast, groups will be able to do this because only those farmers with adjoining farms were invited to join and there have been few losses of members.

Ferreting was the only method of control used by 2 of 3 Societies because it provided carcasses which the operators were allowed to sell in order to supplement their low salaries; it was also cheaper than fumigation. However, ferreting was less effective than burrow fumigation despite the operators' lack of skill at fumigation. Cowan (1984) has shown that rabbit numbers are reduced by only 36% after one ferreting operation. By contrast, Ross (1986) has shown a 64% reduction after one fumigation operation. These reductions are similar to those achieved by the Societies but less than

those obtained by Rowley (1968), who found that reinfestation occurred within 6 months even when a 95% reduction in numbers was achieved over a limited area. Therefore, it is likely that, with the smaller reductions achieved by the Societies over limited areas, the lasting effects of these reductions would be even shorter than 6 months.

All societies and groups used ferreting either as their main or secondary method of rabbit control probably for the same financial reasons rather than efficacy. A lack of funds also probably explained why many organizations employed operators temporarily and why these operators were expected to treat unrealistically large areas of land.

The financial difficulty experienced by the 3 Societies was caused by members resisting increases in subscription rates since grant aid had been withdrawn. This is probably the reason why the rates charged by other societies were also low and many of these societies were probably also experiencing financial difficulties. Groups, by contrast, charged realistic rates which were 2-4 times greater than those charged by societies. Groups were able to do this probably because there was no legacy of grant aid to act as a hindrance.

The restriction by members of the 3 Societies who reared pheasants for sport on timing of control until after the season was finished resulted in a backlog of work which disrupted the programme of visits of the Societies. The restriction on method to ferreting with nets resulted in a relatively ineffective method being used. However, because of their need to obtain funds, only occasionally did the managements of each of the 3 Societies refuse to accept as a member a farmer who imposed these restrictions.

From the findings of this study, it appears that groups have the greater potential to provide farmers in Great Britain with effective coordinated control: they were more able to conduct control on adjoining farms; and they were better financed and therefore more likely to be able to pay operators realistic salaries and to afford all methods of control. It is likely that the number of societies will continue to decrease as the long-standing secretaries or chairmen, who so far have ensured their continuation, retire. It is to be hoped that the number of groups will increase, replacing societies as the main coordinated rabbit control organizations.

RECOMMENDATIONS

The current recommendations on how to run a coordinated rabbit control organization are as follows:

1. All farms should be adjoining.
2. Probably between 10 and 20 farmers should be involved.
3. Subscription rates should be sufficient to enable:
 - a. operators to be paid annual salaries which do not need to be supplemented by the sale of rabbit carcass; and
 - b. choice of control method to be determined by field conditions rather than costs.
4. A rate higher than that normally levied should be charged, initially for 1 year, to ex-members who rejoin.

5. There should be a management committee.
6. One member of the management committee should be in charge of the daily running of the organization and should act as field manager of the operators.
7. A programme of visits to farms by the operators should be planned by the management committee.
8. A record of control operations should be kept.
9. Members should subscribe all of their land.
10. Members who rear game for sport should be discouraged from restricting the timing or methods of control by charging higher rates to those wishing to impose these restrictions.

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