THE EUROPEAN RABBIT PROBLEM IN NEW ZEALAND

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ABSTRACT: Although in much smaller numbers now than previously, the European Rabbit (Oryctolagus cuniculus) is still a major pest and a significant threat to agriculture, particularly sheep farming. The total cost of rabbit control is about NZ$5 million and the net annual return due to increased agricultural production has been calculated at about NZ$60 million. Aerial poisoning using 1080 (sodium fluoroacetate) on carrot baits is the most effective means of controlling the European Rabbit currently used in New Zealand. Approximately 600,000 acres are treated annually at a cost of about NZ$300,000. Due to the extremely rapid replacement of losses, kills of at least 90 percent are required before a significant long-term reduction occurs.

New Zealand is a land of contrasts; from Mt. Cook of 12,349 feet to highly fertile plains near sea level; from semideserts with rainfall of about 12 inches per annum to temperate rain forests with recorded annual rainfalls of over 400 inches; from a land of unique flora to a land depleted over large areas by man and his introduced browsing and grazing mammals.

Of these introduced animals the European Rabbit (Oryctolagus cuniculus) probably causes the greatest economic damage. After its successful introduction in the 1860's, following several unsuccessful liberations, the rabbit spread throughout New Zealand until almost all suitable habitats were occupied. Populations built-up in the absence of effective control to densities of 40 to 50 per acre over many areas until "you could clap your hands and the whole hillside moved" (Figure 1). The rabbit distribution closely paralleled sheep distribution, both occurring in the drier areas of New Zealand. The rabbit was obviously the better competitor. Land carrying only one sheep to five or ten acres often had many sheep equivalents per acre of rabbits living on the same area. Unfortunately, the numbers became so great that vegetation over large areas was reduced to scab weed (Raulia spp.) or bare ground and erosion was accelerated. The exposed top soil tended to disappear under the effects of rain, wind, and frost heave. The problem became so great that many sheep farmers were forced to farm rabbits instead of sheep as the only alternative to abandoning the property, a stage that many ranchers eventually reached under pressure from rabbits and low farm produce prices. The spread of rabbits was favoured by large-scale summer burning of the vegetation and overstocking destroying the ground cover and creating habitats ideal for the rabbit, often in areas where it may not have become a problem otherwise. (Howard, 1958.)

The first rabbit control legislation was passed in 1876 and from then on many people made a living from trapping and poisoning rabbits. During the first and second World Wars and the depression of the 1920's and 1930's rabbits were a major source of meat for many people. These operations were economically significant too, from 1940 to 1947, for example, over 111 million rabbits and hares (Lepus europaeus) were exported and the declared value of these exports totalled over NZ$17 million. (Wodzicki, 1950.) However, the losses in sheep production and damage to field and forest was estimated at that time to be costing the country not less than NZ$6 to 8 million each year. (Wodzicki, 1948.) Consequently in 1947 the Rabbit Destruction Council was formed and they formalised the "Killer" policy. Rabbit Boards were able to undertake the destruction of the rabbits themselves instead of trying to compel landowners to do this. Their objective was extermination of the rabbit.

Then in 1955 legislation was ammended and the rabbit was devalued completely. Consequently any incentive to retain rabbits on a property as a source of income was removed. (N. Z. Statutes, 1955.) At about the same time the use of aircraft to distribute poisoned baits began and rabbit control was revolutionized as large tracts of country could be covered in a very short time at an economical cost. Initial results were outstanding and large reductions in animal numbers occurred. Coupled with improving efficiency in other control techniques and the introduction of the poison 1080 reductions were often spectacular and talk of destroying the "last rabbit" was common. However, the tenacity of the rabbit was underrated and we are still faced with a major pest, albeit at much lower densities. With current increases in the price of agricultural products rabbits are still a pest of major economic significance in areas where they limit production. Currently rabbit control costs

about NZ$5 million per annum, over NZ$1.50 per capita, of which over half is provided directly by the government, the remainder being paid by the landowners in the form of taxes on their property. This annual cost is steadily increasing with little overall improvement in the situation. However the estimated return due to increased production attributable to rabbit destruction is over NZ$60 million. (Kofoed, 1967.)

In 1972 the Agricultural Pest Destruction Council introduced a policy of control rather than extermination in acceptance of the current situation. No end is in sight for these operations and no major breakthroughs in technique are apparent. Modifications to existing control methodology are continually occurring, however, with consequent improvements in efficiency.

From a peak in 1969 of 208 Rabbit Boards covering the whole of New Zealand amalgamations have resulted in less than 170 Agricultural Pest Destruction Boards, as they are now known, remaining. Many more amalgamations are intended while retaining complete coverage of New Zealand. These amalgamations have generally resulted in increased efficiency in the use of manpower and plant, and administration is facilitated.

The most efficient control method for much of the range land is aerial poisoning. Where access is restricted and effective coverage from the ground is impossible large blocks are efficiently treated from the air. Since its inception aerial poisoning has undergone some modification and improvements but the basic technique has remained the same for nearly 20 years. The accuracy of bait placement, whether localized distribution or overall coverage, depends almost entirely on the skill and ability of the pilot. Seldom are ground markers used for anything other than marking the block boundaries. The marking of flight lines to ensure uniform coverage is not usually practised. Consequently the bulk of the work done, covering some 600,000 acres every year, is carried out by a very small group of pilots with the success or failure of the operation largely in their hands.

Two types of operations are involved. Oats are used as a bait material from February to May, (summer/fall), or, less commonly, from July to November (winter/spring). The area treated with oats is about 20,000 acres. About 20 tons of poisoned oats are used, the most common poison used being 1080 at one pound per ton, 0.04 percent. The toxic oats are dyed green with lissamine to reduce the hazard to birds. Two nontoxic prefeeds are usually distributed at the same application rates. Both the toxic and nontoxic oats are boiled until soft and impregnated with molasses to increase their palatability. They are allowed to cool and dry. The poison is added when required and they are then distributed.

One Pest Destruction Board, which uses large amounts of oats for aerial and ground poisoning, has built a processing plant of some complexity. Bulk oats are stored in an underground silo from where they are moved to an overhead tank by a motorized auger. Measured amounts are then released into the four cookers where molasses and water are added and the oats are cooked until soft. The contents of the cooker are then emptied onto one of the two screened tables where the excess liquid drains through the screen and the oats are allowed to dry. They are progressively raked down the table and into a small storage bin. The oats are then removed from this bin, via another auger, for use as nontoxic prefeeds or as toxic baits. A spray system is incorporated into the auger along the bottom of the bin and toxicants and dyes may be applied to the oats as they pass through the system (Figure 2).

The bulk of the aerial poisoning carried out is done from April to August (fall/winter) with chopped carrot as the bait material. Two nontoxic prefeeds and one poisoned feed are normally distributed. Approximately 2,000 tons of carrots are used for poison baits with another 4,000 tons used in prefeeds. Nearly all the aerial poisoning done is in the South Island as most North Island areas are smaller and more accessible. Arsenic is still used in some areas but is gradually being replaced by 1080. In 1970 5.8 tons of arsenic were used but considerably less is used now. (P. Nelson, pers. comm.) The normal application rate is 20 pounds per ton of bait, approximately 1%, with about 600 tons of carrot being used annually. The major poison is 1080 with 740 pounds of powder being used in 1970, much of it being used in aerial poisoning operations. The amount used is increasing each year as arsenic usage drops and the amount of country covered tends to increase. The normal strength used is one-half pound 1080 per ton of bait, 0.02%, with about 1500 tons of carrot being treated annually. The bait is spread at rates of from five pounds per acre to about 12 pounds per acre with uniform coverage over the whole block the usual objective. In many cases, however, bait density is deliberately increased in areas of high rabbit usage with corresponding lower densities elsewhere. The pilot may be told of these areas requiring extra bait but in many cases it is left to his skill in interpreting the signs he sees.

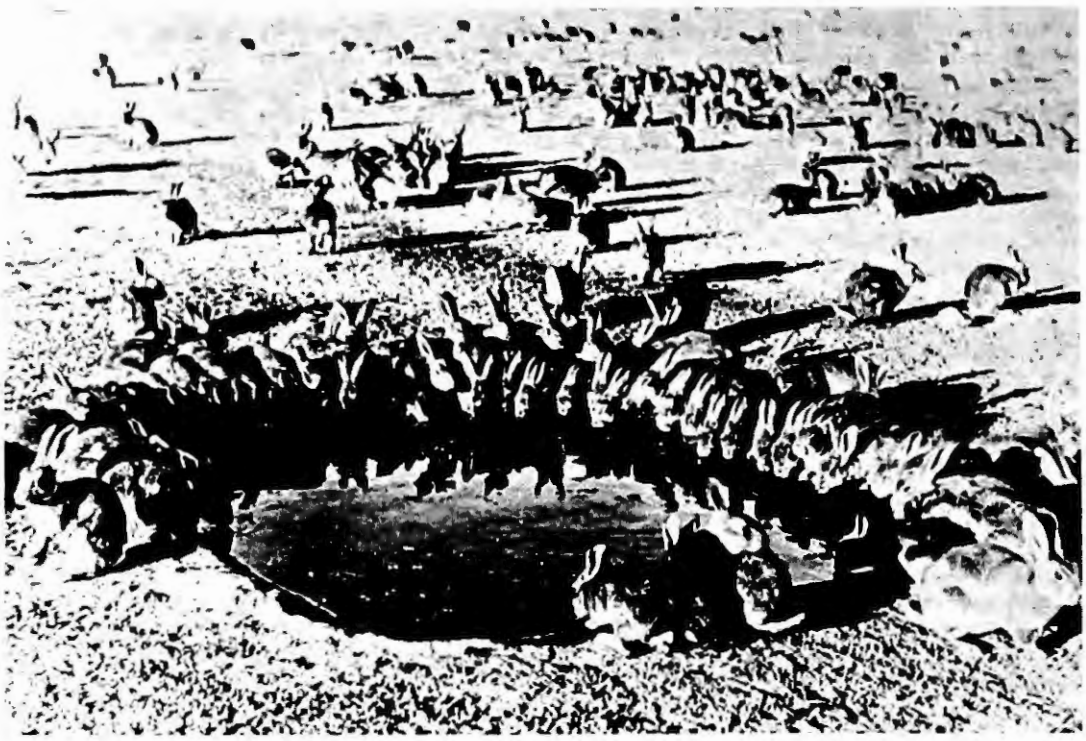

Figure 1. A high concentration of rabbits during a period of severe drought. Photo courtesy M. W. Mules.

Figure 2. The Awatere Pest Destruction Board oat processing plant.

The carrot baits are cut from fresh carrots on the airstrip and the poison is applied to them while in the cutter. Baits are then transferred to the aircraft for immediate distribution. Prior bait preparation avoids any delays due to mechanical failure of the cutter or other equipment on the strip but leads to decay and storage difficulties. The most frequently used carrot cutter is the "Gibson" cutter (Figure 3). Carrots are tipped into a grilled bin from which an auger takes them up into a cutter chamber (Figure 4). Here revolving knives chop the carrots until the pieces are small enough to pass through the grate below. The carrot baits then drop past a spray system, from which toxicants and dye may be applied, onto another auger which lifts the baits into storage bins or directly into the hopper on the aircraft loader. One of these machines can process up to eight tons of carrot per hour. All power comes from a small gasoline engine and the whole machine may be towed from site to site completely self-contained.

The airstrips used are generally small, unsealed strips formed on farms. They are used by top dressing aircraft and by other aircraft working on the farm as well as for pest control operations, but they often leave much to be desired in size, quality, and orientation. Consequently only small aircraft are able to be used in most areas with Fletchers, Piper Pawnees, Cessna Agwagons, and Cessna 185's being the most popular. Trials using helicopters for spot placement of bait have been mooted. The aircraft hold from 800 to 1,100 pounds of bait at one time and one cutter is able to supply two aircraft without delays. In most operations only one plane is used. The normal rate of distribution is about two tons per hour but this varies according to the flying time between the airstrip and the operation site. Over 27 tons of bait have been distributed by one aircraft in one day. Bait distribution on the block is normally in parallel strips flown approximately along the contours. Flying up and down the faces is largely impossible with small aircraft in steep country. Inclusive costs are about NZ$50.00 per ton flown or approximately 50¢ per acre treated.

All toxic carrot baits are dyed green for the protection of birds, coincidently this reduces the risks to the operators since any material showing green dye can be considered to be toxic. To reduce the hazard to stock the blocks to be treated are cleared of stock immediately prior to the operation and they are not returned until any remaining baits are considered nontoxic. Stock losses have occurred when some stock have been accidently left on the block or when vegetation growth has covered and protected the remaining baits. Stock losses are generally very low, however.

A greater hazard, particularly when 1080 is used, is to dogs, either strays wandering onto the block or farm dogs working there. Poisoned rabbit carcases are seldom removed and they tend to retain sufficient poison to pose a significant hazard to any dogs feeding on a carcase. Other non-target species are exposed to the risk of poisoning too but losses are not believed to be significant. Quail and other seed-eating birds may feed on oat grains and wild deer and feral goats will also take oats and carrot baits. Some occassional poisoning losses have been reported.

Hawks, ferrets, and domestic cats are exposed to the risk of secondary poisoning along with dogs. Many hawks are seen feeding on poisoned carcases but it is extremely rare to find a dead bird. Their resistance to 1080 and their selective feeding habits probably account for this. Similarly ferrets and cats are seen to feed on carcases but very few cases of poisoning are known.

Prior to any poisoning operation details must be advertised in the local press, landowners concerned must be informed and the block is usually posted with warning notices. All hunting on the block is prohibited and there are severe penalties for anyone found interfering with an operation or removing dead animals from the area. Legal recourse is available for objection to the operation and Boards are bound by the Court decision.

In the aerial operations legal controls are even more severe than for ground poisoning operations and restrictions are placed on the distribution of baits near waterways or areas of habitation. All operations are under the direct control of a skilled, certified operator.

Many operations are successful in causing substantial reductions in populations. However, failures have occurred in that the kill has not been in the 90 percent plus range required for a significant long-term effect on the population. Irregular bait distribution contributes to operational failures and is due, in part at least, to pilot error. Irregular distribution characteristics with excessive application rates within the swaths leading to interswath gaps contribute to this irregular distribution. (Godfrey, 1973.) This is attributable to the irregular sizes and shapes of baits as they are prepared in the conventional

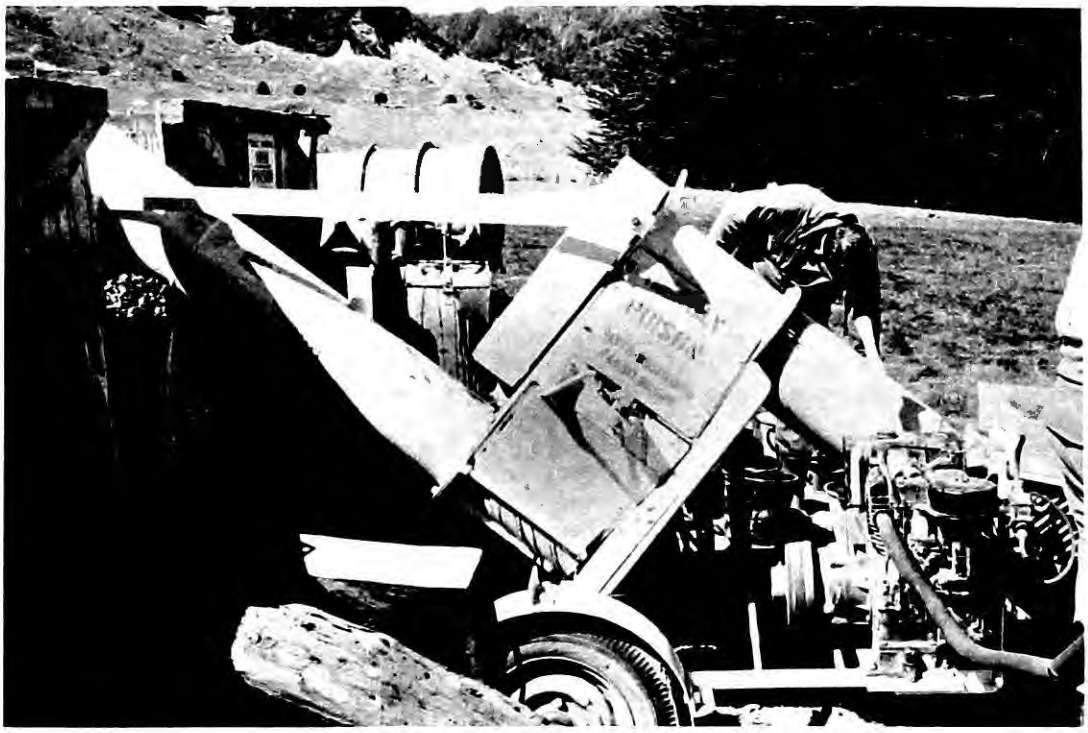

Figure 3. A "Gibson" carrot cutter. The motor drives both augers, the cutter mechanism, and the spray pump. Photo courtesy P. C. Nelson.

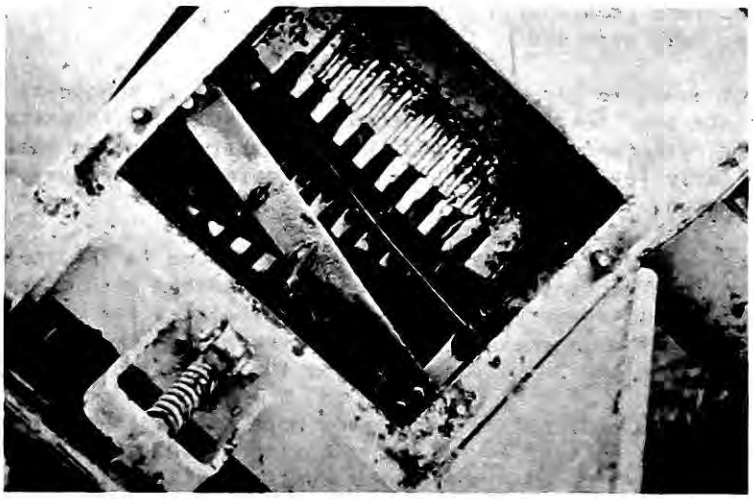

Figure 4. The cutting chamber viewed from above. The carrots fall onto the grate and are chopped into baits by the revolving knives before falling through the grate. Photo courtesy P. C. Nelson.

cutters. As baits tend to be wet they bind together creating uneven flow rates from the aircraft hopper. Improvements in the regularity of bait sizes with consequent improvement in distribution would lower the risk of failure. Recent work has indicated that a small proportion of a rabbit population does not take any carrot bait, either prefeed or toxic. Consequently less than 100 percent of the animals in an operation are susceptible to poisoning. If this characteristic is genetically transmissible a population of rabbits invulnerable to poisoning with carrot baits may develop and new bait materials will have to be found. Poison-shy animals may also increase in numbers but we have no evidence of this occurring at present.

Current research is aimed at improving the efficiency of operations, particularly aerial carrot poisoning; investigating new techniques and chemicals, anticoagulants being under consideration; and investigating nontoxic control methods, chemosterilants being the object of my studies at the University of California, Davis.

Unless there is a significant technological breakthrough, large scale control operations will be needed for the forseeable future. As farming becomes more intensive the capacity of the farming system to tolerate pests decreases and for many there is no place for a rabbit on agricultural land today.

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