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How cattle respond to electric fences

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The University of Melbourne has conducted a series of experiments with electric fences on Victorian properties, using funds from the Australian Meat Research Committee. The authors believe that electric fences can be cheap and effective and should be used much more widely as permanent fences, particularly on beef cattle properties. While electric fencing is not appropriate in all situations, it is difficult to understand why, in times of high costs, more new fences for beef cattle are not electric. The only explanation can be a lack of expertise in their use and maintenance.

The information presented here is selected from data gathered in a more-detailed investigation embracing aspects of both electrical engineering and animal behaviour. A major aim of this research is to determine the best ways to design and operate electric fences to be very effective and simple to erect, without requiring excessive maintenance. In this article, conclusions are based on detailed observations of four groups of cattle as they approached single-wire electric fences.

Realising the need for detailed and continuous observations, John McCutchan and staff built recording equipment which automatically took movie film of cattle whenever they approached an electric fence, 24 hours a day. The equipment was set up on a private property. It aimed at recording activities in a 1 ha paddock fenced on one side with a single electrified wire. This wire was set 0.9 m from the ground and pulsed by a mains-operated, high-power energiser. The height of the wire was chosen carefully so that animals could neither step over nor crawl under without touching the wire. The other three boundaries of the paddock were strong 8-wire conventional fences.
Initial reactions

The first group of cattle to be filmed comprised 19 fully-grown cows, heifers and steers of crosses involving Hereford, Shorthorn, Angus, Simmental and Brahman types. They had not seen electric fences before. On entering the paddock the group marched towards the electric fence. Several animals approached the fence, apparently not realising its presence. Then two or three animals gazed at the fence. One sniffed the wire, received a shock, bellowed and jumped away. In response, many others jumped and the herd moved to the other half of the paddock.

Throughout the following week of observations, animals were confined successfully by the electric fence. Some received shocks but no animals broke through.

No animal received more than a total of three shocks and none returned for shocks after the third day. The majority of shocks were received on the first day, only three on the second day and one on the third day.

The prevalence of shocks on the first two days indicates that animals do not respect the fence initially. These results suggest that two or three days are required before the animals gain full respect. Seven animals were shocked on day one, two new animals on day two and another new animal on day three. Thus, a total of 10 out of 19 animals were shocked, amounting to 53 per cent of the herd. The rest of the group apparently learned respect without receiving shocks.

Of the 14 shocks received by the group, nine occurred when an animal investigated by sniffing the wire with its nose. Thus it is not surprising that after the second day, no animal sniffed the fence. However, one animal was observed to approach within one metre of the electric fence more than 15 times a day on days five, six and seven. This animal looked at the fence a few times, but never sniffed it. On each occasion it grazed at the base of the fence.

When the frequency of approaches closer than one metre over the seven days was analysed, it showed a big variation between individuals. This variation ranged from no visits, through one visit and so on, up to 19 visits on day seven. On a group basis, the daily variation in approaches over the week appeared to be related to grazing cycles. When they were in the vicinity of the fence, some animals tended to graze up to the wire. The animal which approached 19 times may have been an exception here since it appeared to graze at the electric fence rather than to follow the group tendency to circulate around the paddock while grazing.

Night time activity was filmed using infra-red techniques to avoid disturbing the animals. Individuals could not be identified. Some activity occurred at the fence at night but much less than during the day. Fence investigations were rare and appeared to be made by a small proportion of the herd.

Previous training

A second group of 19 animals of similar description to the first were trained to respect electric fences before being filmed in a nearby identical test paddock.

The notion of training is not new. In this experiment it consisted of placing the animals in a small electrified yard for one day. The animals had never seen electric fences before, and the idea was to teach them respect for electric wires before release to a paddock, one boundary of which was fenced only by a single electric wire. Without previous experience, a single wire appears to be a rather flimsy physical barrier, but after training, it is a psychological barrier and therefore more effective than many conventional fences.

The training yard was approximately 0.25 ha in area and consisted of a very strong conventional fence with an offset outrigger electric wire attached to the inside of the yard. The small size of the yard closely confined the animals, thus increasing the number of contacts with the fence. This ensured that all animals could witness others being shocked and learn from the experience. The strong conventional fence prevented any breakthroughs during training.

In terms of breakthroughs training was unnecessary since, as we have seen, Group 1 animals, which were not trained, were successfully confined. However during that first experiment feed was plentiful, so the pressure on the fence was due to curiosity rather than hunger. Despite this, careful analysis of the films showed that the theory behind the use of the training yard was sound, and that training had significant effects on the animals' attitudes to the fence.

In the first day in the training yard, more animals were shocked a greater number of times compared with untrained animals during their first day in the previous test paddock. One received seven shocks. Only one animal touched the wire on the second day, and none thereafter.

After release to the test paddock only one animal from the trained group was shocked. Thus, the training yard functioned as expected. It was interesting to note that after training, animals approached and looked at the fence wire significantly more often than untrained animals over a comparable period. Apparently training had increased the animals' awareness of the fence and they had learned not to touch (sniff) it. Evidently they associated the single wire electric fence with the offset electrified wire on the heavy conventional fence of the training yard.

A further test of training

A third group of cattle on an Angus breeding property demonstrated great respect for a single-wire electric fence after training. The 23 heifers, which had never seen electric fences before, were first conditioned to a feeding routine involving hay spread out near one end of a long 10 ha paddock. After seven feeding days spread over three weeks they were placed for one day in a training yard in which a single offset electrified wire had been added to the strong conventional fences. Then they were returned to the normal paddock, but a single wire electric fence now prevented them from reaching the hay at their accustomed feeding spot.
Summary and conclusions

Four groups of adult cattle of various types were totally confined for extended periods by lightweight electric fences. The fence was successful even when hungry Angus heifers were enticed by the sight of hay, in anticipation of being fed.

Animals in the paddock learned full respect for the fence within three days, and one day of training in small conditions by single wire electric subdivision fences can escape within 24 hours if the power is left off.

Under more-normal grazing conditions, power failures of several hours or even one or two days probably will not result in animal escapes. However with mains power, the cost of the electricity saved (about a cent a day per energiser), is insignificant.

For battery-powered energisers there is a strong incentive to prolong battery life, or to reduce the number and cost of solar cells to recharge the batteries. All of our studies indicate that there is great scope for reducing the pulse rate at night, possibly to one per five seconds, and also some scope for reduction during the day with trained animals. This might be based on the intensity of daylight, or have a random variation to prevent the animals learning to predict the 'safe' periods for breaking through.

Turning the power off—will animals escape?

It is possible that once animals respect electric fences, a farmer could turn the power off and it would be some time before they broke through the wire. Fences could be turned off for repairs, and battery powered fences could be turned off intermittently to save battery life.

To test whether these proposals are worth considering, a fourth group was used in an experiment, again on the second property, to measure how long the animals took to notice that there was no pulsing in the single wire. It took until the sixth day (nearly 150 hours) after turning the power off before animals passed under the wire. On that day eight got through.

This result must be interpreted carefully in terms of the paddock size, stocking rate, and urge to get out. Earlier work by John McCutchan established that trained animals confined under intensive conditions by single wire electric subdivision fences can escape within 24 hours if the power is left off.

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Four groups of adult cattle of various types were totally confined for extended periods by lightweight electric fences. The fence was successful even when hungry Angus heifers were enticed by the sight of hay, in anticipation of being fed.

Animals in the paddock learned full respect for the fence within three days, and one day of training in small electrified yards enhanced this process. (Such training is simple and can be done in existing yards). Observations showed a range of attitudes to the fence within the groups. About half the animals were never shocked and tended to avoid the fence. Others persisted in grazing near the fence. Thus, one cannot expect every animal's attitude to the fence to be the same but the effect on the whole group is good confinement.

In various experiments involving about 100 cattle, only one 'rogue' animal which would not respect electric fencing was encountered.

Depending on factors such as stocking rate, a fence may be turned off for several days before cattle break through. Fences could be turned off for repairs and it may prove practicable to prolong the life of energiser batteries by reducing the pulse rate at times.

One must conclude that, under appropriate management, lightweight electric fences can be a very effective and far cheaper alternative to conventional beef cattle fences. They should make ideal subdivision fences, and even boundary fences, where cattle on neighbouring properties will respect the wires. On road frontages, more substantial fences would be recommended because of the possible lack of respect by travelling cattle and the likelihood of other species of animals passing through.