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EVALUATION OF A BUFFALO FLY TRAP ON TWO QUEENSLAND BEEF PROPERTIES

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Summary

A newly developed buffalo fly trap was evaluated on two Queensland beef properties between February and May 2002 as a tool for non-insecticidal control of buffalo fly. The trap is basically a short tunnel through which cattle have to regularly pass. Due to changes in light levels on entering the tunnel, flies leave the cattle and are subsequently caught in cages attached to the sides of the tunnel. The trap is simple to build and since there are no obstructions in the tunnel, training of cattle is relatively easy.

The traps were installed on two properties as the sole access to water or feed supplement. Buffalo fly numbers were obtained at regular intervals from a sub-sample (10-12 animals) of the trapped and a control group. Geometric means of fly counts were used to compare fly populations between the groups.

At Sunnyholt near Injune, buffalo fly numbers remained low throughout the trial, with a maximum mean fly count of 25 in the control group. Between day 20 and 40 (when the trial was terminated due to low fly numbers), the mean buffalo fly counts in the trapped group were on average 81% lower than in the control group. At Yackatoon near Ipswich, the mean buffalo fly population in the control group reached 400 flies per side. The population in the trapped group was on average 66% lower than the control group between days 21 and 42.

Installation and use of the new buffalo fly trap were also evaluated. Trap installation was easy in both trials. The trap design proved to be practical and effective, although some suggestions for possible changes to trap cages or baffles are provided. A direct attempt to get cattle to use the fully installed trap failed at Sunnyholt. Trap use was achieved through familiarisation and stepwise installation of the trap in both trials, with the process completed within 10 days at Yackatoon.

Results from these commercial beef properties were similar to those previously obtained on DPI research stations, ie. buffalo fly population reductions of 60 to 80%. It is therefore recommended that the proposed implementation project proceed and that it include:

- demonstrating the tunnel's effectiveness in commercial production systems throughout Australia's buffalo fly areas
- improving the design, construction and application of the buffalo fly trap
- organising field days and demonstration sites.

Background

A buffalo fly trap, developed during a project on "Non-insecticidal control of buffalo flies using behaviour-modifying systems" (TR.062, funded by DPI and MLA) achieved buffalo fly population reductions of 60 to 75% in preliminary trials on departmental research stations. The trap is basically a short tunnel through which cattle have to regularly pass. Due to changes in light levels on entering the tunnel, flies leave the cattle and are subsequently caught in cages attached to the sides of the tunnel. The trap is simple to build and since there are no obstructions in the tunnel, training of cattle is relatively easy. This buffalo fly trap is thus a non-insecticidal tool for the control of buffalo flies.

In the field trials on DPI research stations, cattle were either walked through the trap daily or their access to drinking water was only possible through the trap. In all experiments reductions of 60 to 75% were observed in buffalo fly populations on the animals using the trap compared to a control group. The purpose of this study was:

- to evaluate the effectiveness of the tunnel trap in reducing buffalo fly populations on commercial beef properties
- to gain experience and obtain feedback from producers on the design, construction materials and operation of the buffalo fly trap.

Methodology

Property selection

Two collaborating properties were sought through the MLA newsletter, the South-East Regional Beef Research Committee, APHS stock inspectors and QBII staff. The selection criteria for the properties included reasonable buffalo fly numbers, no ongoing chemical buffalo fly treatment, the availability of two equivalent groups of cattle in similar environments with a cattle-free buffer zone of at least 100 metres for at least 3 months. The buffalo fly trap was installed so that the animals had to walk through the trap at least on a daily basis, eg sole access to drinking water through the tunnel.

The properties selected through this process were Sunnyholt near Injune (owner/collaborator: Wally Peart) and Yackatoon near Ipswich (stud manager: Trevor Griffiths; collaborator: Flycam Pty Ltd, Bob Tozer).

Trial design

The numbers of buffalo flies on two groups of cattle were compared over approximately three months. The animals in both groups were of similar breed, age and sex and were kept in similar production environments (feed, water access, stocking rate). One group (trap group) used the buffalo fly trap on a daily basis; the control group had no buffalo fly control treatment. The trap was installed at the only access/exit to a small yard, containing either the sole watering point (Sunnyholt) or the feed supplement Prolix (Yackatoon). Fly populations in the two groups were obtained from weekly fly counts on 12 randomly selected animals at Sunnyholt and on 10 designated animals at Yackatoon in both control and trapped groups. The geometric means of the fly counts were used for the comparison.

Trap construction

The buffalo fly trap (2.4x1.8x0.8 m LxHxW, inside measurements) was built with a demountable steel frame with sides and roof covered by plywood panels (12mm) (see photo on cover). The plywood and frame were painted matt black. A window (1.9x0.2 m) was cut into each of the side panels (0.7-0.9 m from ground). Fly trap cages consisting of aluminium fly screen over an aluminium frame (2.0x0.66x0.3 m LxHxW) were attached to the side panels, to completely cover the windows. Door sealing strips were used between the side panels and the cage to eliminate any gaps. A funnel shaped baffle (with a 40 mm gap) made from perspex was placed in the trap cages above the window (see photo on cover). A black plastic sheet was used in the Sunnyholt trial to protect the roof from rain and to cover the top (0.2 m) of the entrance.

Approximate costs for the materials used to construct the trap are provided in Table 1.

Table 1: Approximate material costs for one buffalo fly trap.

Trap part (material)	Cost ($)
Frame (steel)	65.00
Sides, roof (timber, plywood)	180.00
Trap cages (aluminium frame and flat bar, aluminium flyscreen)	110.00
Baffles (perspex)	180.00
Sundries (paint, screws, bolts, sanding belts, door seal)	150.00
Total	**685.00**

Trap installation and cattle training

Sunnyholt: Before the start of the trial, the trap was fully installed on a yard containing the sole watering point in a 380 acre paddock for a herd of 44 fixed composite (four breed) cows and their calves. The control group (same breed, similar paddock) was separated by at least 200 m from the trap group. The trap group could be mustered into the watering yard through an alternative path (laneway).

Yackatoon: Purebred Droughtmaster aged female breeders, 52 head with 48 calves (6-8 months) and 54 head with 28 calves (2-4 months) running on native pasture in open ironbark scrub paddocks of 180 and 100 acres, were allocated to a trapped and a control group, respectively.
Day –14: Prolix liquid supplement was provided to the trap group in a small holding paddock near the stockyards.
Day –9 : The tunnel without any fly cages was installed in a gateway to the holding paddock, with cattle having access to the paddock and the supplement by passing around trap.
Day –7: Mobile fence panels were installed on one side of the trap, leaving the other side open. Cattle were mustered to the supplement on two consecutive days and allowed to return to the paddock by passing through or around the trap.
Days –4 and –2: Two pre-trapping fly counts were obtained.
Day –2: The other side of tunnel was fenced off and cattle mustered to the supplement, returning to the paddock through the tunnel.
Day 0 (3 April 2002): Trapping cages were installed and cattle mustered to the supplement on two consecutive days, returning to the paddock through the buffalo fly trap.

Day 2: Fly count and observation of cattle at the trap.
Day 7, 14, 21… 49: Regular weekly fly counts on both groups. The trial was stopped at day 49 (22 May 2002) due to low fly numbers.

Fly counts

For each trial, the same operator, using binoculars, counted the buffalo flies on one side of each selected animal on a weekly basis. In the Yackatoon trial, all visible flies were counted, whereas at Sunnyholt flies on the head, neck, belly and legs were not counted. Geometric means of fly numbers were used to measure and compare fly populations.

Cattle counter

A low-power usage cattle counter was designed and assembled by SciSat Products, Warwick, Qld 4370. It is based on a laser beam, a light sensor, LCD readout and electronic parts to drive the laser (30 pulses per second), interpret sensor readings, keep track of counts and transfer information to display on demand. The cattle counter is driven by a 6V power source (battery). The laser beam and light sensor were installed at cattle mid side height on opposite sides of the trap. An interruption of the laser beam of >0.5 sec resulted in one count being added to the tally. The number of cattle passing through the trap could be read from a liquid crystal display (LCD) after pushing a button.

Results and discussions

The two beef properties selected for this buffalo fly trap evaluation were Sunnyholt near Injune and Yackatoon Droughtmaster Stud near Ipswich. The two properties represented different cattle growing areas in Queensland, with differences in animal breeds, climatic conditions and pasture types. The trials commenced in February at Sunnyholt and in late March at Yackatoon. Buffalo fly numbers were low at the start at Sunnyholt, but they were expected to build up in the cooler autumn months, particularly if rain arrived. At Yackatoon, the buffalo fly numbers were reasonable in March, at about 500 flies per animal.

The incentive for cattle to use the buffalo fly trap was a sole watering point at Sunnyholt and a feed supplement at Yackatoon. The frequency of trap use by the animals is not exactly known, however it is assumed that the animals visited the water and the supplement at least once a day. There is some evidence that the visits to the supplement could have been twice daily.

The results of the two trials are presented separately below.

Sunnyholt trial – Fly populations

The complete buffalo fly trap was installed in the only access route to the sole water source on 27 March 2002 (see next section for installation and training history). Fly counts were started on 29 March and then performed at weekly intervals. The geometric means of buffalo flies per animal side for the control and trapped groups are given in Table 1 and Figure 1.

Table 1: Geometric means of buffalo flies per animal side for control and trapped groups and percentage fly population reduction in Sunnyholt trial.

	Date of fly count				
	29/03/02	09/04/02	16/04/02	22/04/02	06/05/02
Control group mean	20.1	10.7	24.5	16.5	22.7
Treatment group mean	7.5	8.0	3.8	4.7	3.0
Fly population reduction	63%	26%	84%	72%	87%

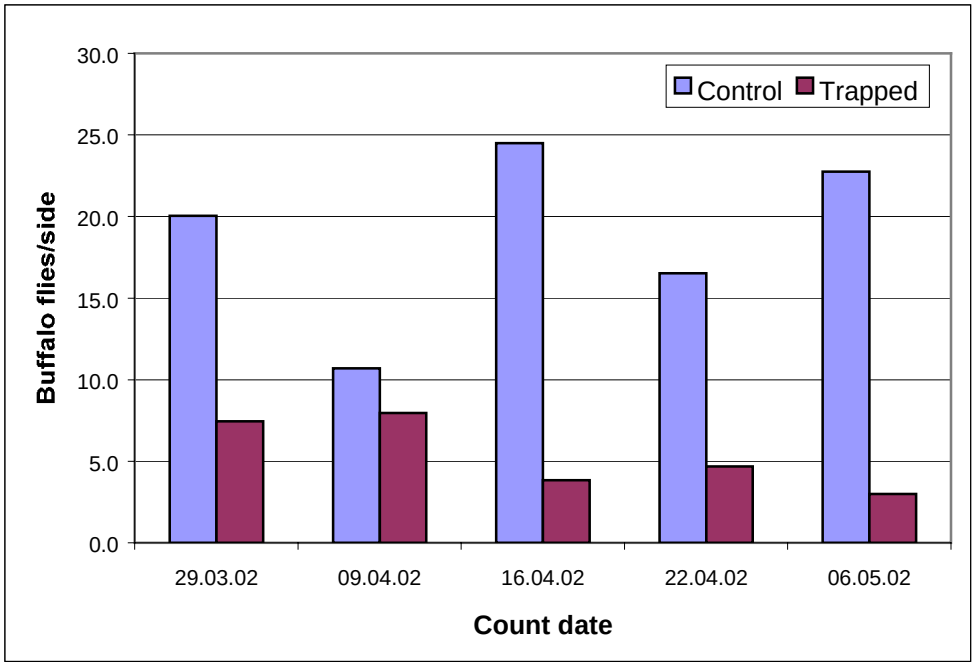

Figure 1: Geometric means of buffalo flies per animal side for control and trapped groups in Sunnyholt trial (trapping commenced 27/03/02).

The mean numbers of buffalo flies on the animals in the trapped group were always lower than the control group. The percentage reductions varied from 26 to 87%. No pre-trapping fly counts were carried out in this trial to establish the buffalo fly populations in the two groups. However, it appeared that the reduction was increasing with time, with an average reduction of 81% over the last three counts (day 20 – 40), compared to an average of 45% over the two first readings. Due to the low fly numbers and the large variability in the fly counts, these values are at best indicative of the trap's efficacy in reducing fly numbers.

The buffalo fly numbers remained low throughout the Sunnyholt trial. The trial started with more than a month delay from the anticipated start, due to the necessary animal training (see next section). Thus, the rain had passed and the temperatures had started to fall. We had decided to only count the flies on the body and exclude flies on head, neck, legs and belly. This would have given us more consistent fly counts as flies on the latter body parts are harder to see and count. On the last count (6 May 2002) the flies on head and neck were also counted and in this case they accounted for 40% of the total count per side. Thus, the total side counts (as used in the Yackatoon trial) could have been about 40% higher than the tabled counts.

The variability of the fly counts was high within both groups, but particularly so in the control group where some high counts occurred. The use of randomly selected animals for fly counts

contributed to the variability. Most of the animals did not have visible identification tags, thus random selection was the only choice. The coefficient of variance of the fly counts varied from 49 to 94%.

During the training phase, cattle used a partially assembled trap for some time. The fly trap cages were attached about a fortnight prior to the start of the trial, with the roof of the tunnel being installed as the last component two days before the first count. It is possible that the difference in the fly populations in the first count was caused by this pre-trial use of the trap. However, it cannot be ruled out that the difference between the two groups existed prior to the trap being used.

In conclusion, the mean fly numbers in the trapped group were consistently lower than the control group. However, the observed reductions in fly populations cannot unambiguously be ascribed to the use of the trap, although there are indications that the trap lowered the population to some extent.

Sunnyholt trial – trap installation and training

The installation of the buffalo fly trap at Sunnyholt was carried out on 13 February 2002. The trap was completely assembled, including a black plastic sheet covering the ceiling and about 0.2 m of the top of the tunnel. The trap was installed in an entrance gate to a yard containing the sole watering point and both sides were fenced off. Subsequently, cattle were seen approaching and camping near the trap but they did not pass through it. The next morning, the cattle were mustered into the watering yard through an alternative access. Some cows and calves left the watering yard through the trap but many remained inside. They were subsequently returned to the initial paddock through the alternative access. The mustering was repeated the next day with the same result. The plastic sheet cover was then removed from the trap and the mustering exercise repeated. Although more animals went through, many would still not leave the yard through the trap. The trap cages, the roof and the fencing panels were removed on both sides, so that the animals could pass beside the trap to reach the water. About three weeks later, the trap cages and fencing panels were re-installed and cattle started to use the trap without a roof. Another week later the roof was put in place and it was observed that all cattle were now using the trap. The fly counts were started two days after the installation of the roof (29 March 2002).

The trap was completely assembled and installed at the start of the trial because in previous trials on DPI Research Stations a single muster of cattle into the fenced off area was adequate training. The animals voluntarily left the restricted area through the trap and subsequently returned to access the water. The owner of Sunnyholt was confident that his cattle would pass through the short, unobstructed tunnel passage with minimal training. Although some animals walked through the tunnel, many did not follow the “leaders”. The plastic sheet which covered part of the trap entrance flapped a little in the wind, in spite of being tightly fitted. Thus, the plastic was removed, but many animals still did not pass through the trap. Therefore, the side panels and trap cages were removed to allow cattle to reach the watering point and to become familiar with the trap. The training and trap re-installation process took over one month before all cattle used the trap. The process had been prolonged by rain which temporarily provided alternate drinking water for the animals in the paddock.

It was obvious that training was required for the animals at Sunnyholt to use the trap. The initial refusal of the cattle to go through the fully installed trap made the subsequent training

harder. It is thus recommended that a trap familiarisation process is used where the animals are allowed to pass near the partially or fully assembled trap. The rate of assembly and installation can then be determined from the cattle response to the trap.

Sunnyholt trial – comments from property owner

The principle of the trap is good and it works. We had trouble getting the cattle to walk through the trap and had to let them walk by it and round it for a week before we made them walk through it, firstly with the roof off then with it on. The trap could be improved by making the width adjustable to help the cattle get used to going through it .The fly catchers need to be much more robust and self emptying or provide the ants with better access. We would suggest that the trap could be longer with detachable brushes to help remove flies. We would also suggest the designing of multiple traps to facilitate larger mobs of cattle. We would also suggest set down wheels to make the trap more transportable. I'm not sure the traps are in the right place perhaps they should be vertical. The perspex baffles broke apart at the glued positions.

Yackatoon trial – Fly populations

The buffalo fly trap was installed in the gateway to a holding paddock containing Prolix feed supplement on 3 April 2002 (see next section for installation and training history). The animals had access to the supplement for two weeks prior to trap installation. Two pre-trapping fly counts were carried out (day -4 and -2). Fly counts were then performed at weekly intervals with one additional count in the first week (day 2). The geometric means of buffalo flies per animal side for the control and trapped groups are given in Table 2 and Figure 2.

Table 2: Geometric means of buffalo flies per animal side for control and trapped groups and percentage fly population reduction in Yackatoon trial (trap installed 3 April 2002).

	Date of fly count (2002)									
	30.03*	01.04*	05.04	10.04	17.04	24.04	01.05	08.05	15.05	22.05.
Control group mean	282	319	315	386	408	412	242	284	180	75
Trapped group mean	230	267	218	218	261	164	125	70	36	54
Fly population reduction	19%	16%	31%	44%	36%	60%	48%	75%	80%	29%

* Pre-trial counts

The mean numbers of buffalo flies on cattle were similar in the two groups before the start of the trial, with the trapped group's fly population slightly lower (19 and 16%) than the control group. After the installation of the trap (3 April 2002), the fly population decreased whereas the control group population increased during April. The fly population in the trapped group was reduced by a maximum of 80% by mid May. The last fly count in May took place on a cold and wet day which was preceded by cold nights. The last fly count in the control group was much lower than the previous count, possibly due to the more exposed location of the control paddock compared to the trapped group.

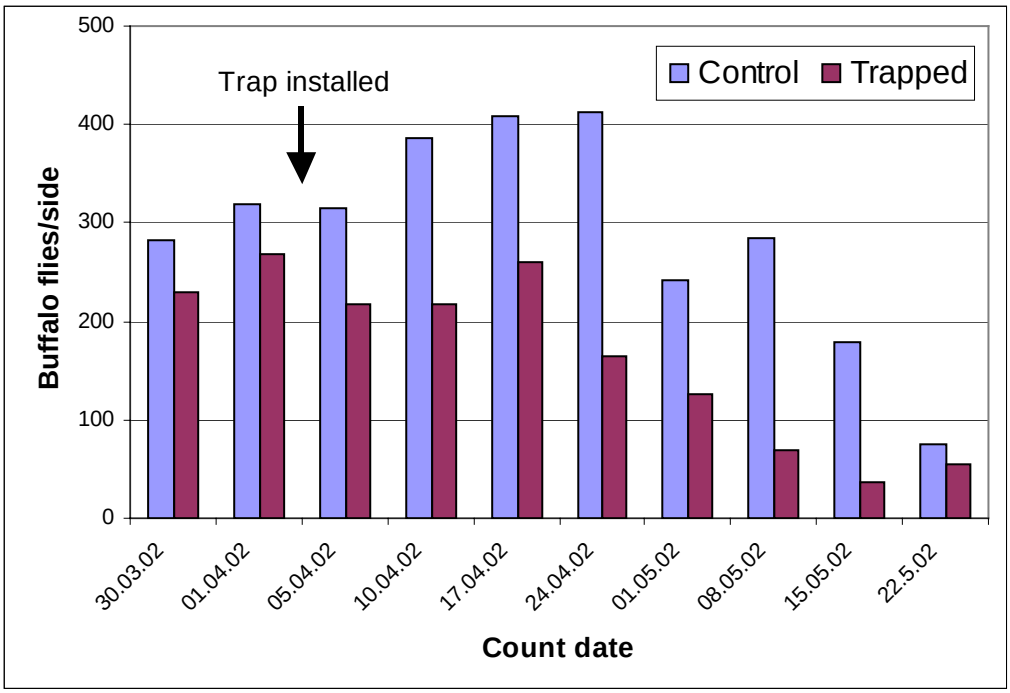

Figure 2: Geometric means of buffalo flies per animal side for control and trapped groups in Yackatoon trial.

The average fly population reduction for counts between days 21 to 42 was 66%. The corresponding value for the entire trial (after trap installation) was 50%. To reach maximum fly population reductions it would take at least a few fly generations. Thus, it is likely that maximum reductions would not be achieved until early May. This is supported by the 75 and 80% reductions observed on 8 and 15 May.

The numbers of buffalo flies were reasonable at Yackatoon, with the control group reaching about 800 flies per animal. The trial was terminated when the fly population crashed in May due to cold and windy weather. The fly counts at Yackatoon were carried out on the same 10 animals in each group at each count. This combined with the higher number of buffalo flies, resulted in lower variability within the groups. The coefficient of variance ranged from 24 to 71%, considerably lower than in the Sunnyholt trial. There were two pre-trial counts and eight fly counts during the trial.

We made an attempt to determine how many animals passed through the trap to access the supplement. A counter, based on a laser beam traversing the trap, was constructed in collaboration with SciSat in Warwick. Initially the beam and light sensor were attached to the trap walls. However, the narrow beam, the small sensor and the flexibility of the trap made it impossible to maintain beam to sensor contact. The beam and sensor were then moved onto posts outside the trap, with the beam passing through holes in the tunnel walls. This arrangement allowed us to get some counts, but movement of the trap or the beam brought renewed misalignment. In a period from 1600 h to 1000 h the next day, 276 counts were recorded. Thus, 138 animals visited the feed supplement during that time, indicating that the animals visit at least once, but some twice daily (100 head in paddock).

The buffalo fly population data from the Yackatoon trial is coherent and relatively precise. It provides good support for the hypothesis that the buffalo fly trap reduces fly populations on cattle using the trap regularly.

Yackatoon trial – trap installation and training

The incentive for cattle to use the buffalo fly trap at Yackatoon was the supply of a liquid, molasses based feed supplement (Prolix). The supplement was provided in a fenced holding paddock near the stockyards. After 5 days, the trap frame was placed in the laneway leading to the supplement, so that cattle passed by the trap to reach the supplement. Two days later, the panels were installed on one side of the trap and cattle mustered to the supplement for two consecutive days, allowing them to return to the paddock through or around the trap. The panels on the other side of trap were installed, the cattle mustered to stockyards and returned to the paddock through the trap (without fly trap cages). Three days later, the fly trapping cages were installed and half the herd mustered to the supplement and returned to the paddock through the trap. The following day all cattle were mustered to the supplement and observed returning to the paddock through the trap. Thus, the training of cattle to voluntarily use the trap had been successfully completed in 10 days.

The trap removed large numbers of buffalo flies from the animals with so many animals passing through the trap. The vast majority of the recently trapped flies were active in the top corners of the cages. This underlines the importance of a fly-proof seal between the trap and the cages, particularly at the upper end of the cage. Most of the dead flies accumulated on the perspex baffle. After one week, large number of flies had accumulated in the trap cages covering part of the perspex baffle. Ants were seen in the trap cages, but unlike the previous smaller trials, not all trapped flies were removed. We removed the dead flies and cleaned the perspex baffles twice during the trial. The dead flies were almost exclusively buffalo flies and we estimated the numbers removed from the trap cages at about 73,000 (day 21) and 25,000 flies (day 42).

The step-wise process of familiarisation and training of cattle using the trap at Yackatoon was completed without any problems and in a short time. It is recommended that similar processes be routinely used for buffalo trap installations. Observations of cattle behaviour during the process will allow steps and time required for a successful training to be adapted to existing circumstances.

Yackatoon trial – comments from producer and trial operators

The farm manager observed “that the animals in the trapped group exhibited less lesion trauma from *Stephanofilaria* spp. than the control group animals. He was also surprised at the ease with which cattle adapted to using the trap”.

The trial operators made the following comments for improvement to the trap design:

- Tunnel structure needs to be constructed of heavier duty materials.
- Structure needs to be more mobile and be able to be towed from paddock to paddock
- The gap between the perspex sheets in the trapping module (=baffle) needs to be made narrower to lessen escapes
- The top section of the trapping module could be manufactured from a clear solar material to enhance internal temperatures and assist in more rapid mortality of flies due to desiccation
- The application of a NLIS device and reader to the race could highlight individual usage of the trap.
- Commercialisation has good potential in the marketing of the trapping module as a separate entity. The grazier would be responsible for the construction of the tunnel.

General observations and comments (DPI group)

The traps were installed on mostly vegetation-free soil in a gateway to water at Sunnyholt and on a grass-covered gateway at Yackatoon. However, after a week's use the grass had disappeared at Yackatoon. Both trap passages consisted then of loose soil, and dust was generated by passing animals. The dust settled in and on the trap cages, particularly the perspex baffle (there appears to be electrostatic adherence between perspex and dust). The dust cover on the baffle reduced the amount of light entering the trap windows. As this light is responsible for attracting the buffalo flies into the side cages, a reduction in light intensity may reduce the effectiveness of the trap. The baffles were cleaned occasionally during the trials to reduce the reduction in light intensity. A better solution would be to use alternative material for the baffles eg. fly screen. Omitting the baffles, possibly in combination with a concomitant alteration of the trap cage design, could also be considered.

Conclusions

Results from the trials with a newly developed buffalo fly trap on two Queensland beef properties between February and May 2002 were similar to those previously obtained on DPI research stations, ie. buffalo fly population reductions of 60 to 80%. The design and the installation of the trap and the training of animals to use the trap were also investigated and in general found to be appropriate. It is therefore recommended that the proposed implementation project proceed and that it include:

- demonstrating the tunnel's effectiveness in commercial production systems throughout Australia's buffalo fly areas
- improving the design, construction and application of the buffalo fly trap
- organising field days and demonstration sites.