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Prepared by: Anne Marie Huey

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PDS - Implementation of Producer Demonstration Sites to increase research adoption and practice change in the Kimberly and Pilbara

PDSWA002 - Assessing the economic and logistical benefits of using the Tickoff system to control external parasites

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Abstract

Internal and external parasites, particularly buffalo fly, cost the northern beef industry $20-30 million a year[1]. Treating buffalo fly infestations can be difficult in extensive northern grazing enterprises due to difficulty of accessing cattle during the wet season. The Tickoff system is currently used in South Africa to remotely treat cattle herds and wild game for external parasites such as ticks and flies. It was proposed by the Kimberley Beef Research Committee to trial the system in Western Australia to determine whether cattle could be effectively treated for buffalo fly during the wet season, without the need for holding cattle in yards for extended periods. Unfortunately, when used with Supona to treat buffalo fly, the system did not deliver accurate dosages (based on 50ml for every 150kg liveweight) when tested in a simulated treatment. The overall efficacy of the treatment could also not be assessed as climatic conditions were not conducive to large buffalo fly populations for the duration of the trial. As a result, the Tickoff system is not considered appropriate for use in extensive beef herds.

Executive summary

Buffalo fly have a significant impact on the health of northern cattle and large infestations can seriously reduce production. The primary impact of buffalo flies includes reduction in weight gain, reduction in weight gain in calves, lesions and potentially pinkeye[2]. Estimates of the economic impact of buffalo flies on the northern beef industry are in the order of $20-30 million a year.

The most common method of treating for buffalo fly is to backline cattle with registered chemicals such as, but not limited to, Supona™. This requires cattle to be processed in yards and usually occurs in conjunction with planned mustering rounds. Paddock-based methods of control include back rubs, ear tags and fly traps[3]. These are useful as cattle can be treated during the wet season when buffalo fly are most prevalent.

The Tickoff system is used in South Africa to treat cattle herds and wild game. It is designed to supposedly deliver a tailored dose to individual animals, based on liveweight. This would represent a significant advantage over methods such as back rubs, which are not able to measure dosage.

The Tickoff system was trialled at Country Downs Station, West Kimberley WA to determine its practicality and efficacy in northern Australian conditions. Country Downs station was selected as it has very little surface water and cattle are accustomed to accessing water and supplement through spear traps. The system was installed in the out-trap at Gardenia Yards during the latter part of the 2010-11 wet season. When compared to the existing method of control which involved trapping cattle for two days then treating them with Supona™ as they exited the yards, the Tickoff system was considered to have major advantages. In particular,

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[1] Sackett D and Holmes P, 'Assessing the economic cost of endemic disease on the profitability of Australian beef cattle and sheep producers', Meat & Livestock Australia Final Report AHW.087, April 2006.

[2] Queensland Department of Agriculture, Fisheries and Forestry, 'Production losses of due to buffalo fly in cattle', 2013 [http://www.daff.qld.gov.au/animal-industries/animal-health-and-diseases/protect-your-animals/buffalo-fly-control-in-cattle/production-losses-due-to-buffalo-fly].

[3] Recommendation for integrated buffalo fly control – Revised Edition, Meat & Livestock Australia, 2011.

Tickoff had the advantage of not having to hold cattle in yards, and therefore off feed, for two days.

However, when the system was critically assessed for accuracy and reliability, Tickoff was found not to be able to deliver the recommended dose of chemical to individual animals. When trialled in a race situation, the Tickoff system completely missed 55% of animals and of the 45% that were targeted, the system dispensed between 1% and 42% of the recommended dose.

The trial was unable to adequately assess the efficacy of the Tickoff system as climatic conditions in the subsequent two wet seasons did not favour buffalo fly and populations were not considered damaging enough to warrant treatment. However, given the serious concerns with accuracy and reliability, the Tickoff system is not considered appropriate for remote treatment of buffalo fly in northern beef herds.

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1 Background

Internal and external parasites, particularly buffalo fly and cattle ticks cost the northern beef industry $20-30 million and $146 million a year respectively (MLA estimates). Losses include increased mortality and morbidity rates, decreased weight gain, decreased immunity and fertility decline. In addition, parasites represent a significant animal welfare concern and leave cattle vulnerable to diseases such as tick fever and *Stephanofilaria stilesi* infection.

Producers use a range of methods to apply chemical controls. One of the most common is 'back-lining' cattle in the yards, although several paddock-based options such as rubs, ear-tags and fly traps are in use. While these methods have had success in controlling parasites there are disadvantages associated with each of them.

Rubs can be effective but not all animals use them and it is impossible to control the dose any one animal receives. This could result in under-treating animals leading to resistance in parasite populations, or over-treating which can result in residues which can then trigger domestic withholding periods and export slaughter intervals[3].

Resistance occurs when animals receive less than the required dose to control the target parasite. While a proportion of the population may still be killed, a proportion which has a naturally higher tolerance to the chemical will survive and subsequent generations will become genetically predisposed to withstand further application of the control chemical. Buffalo fly resistance to the synthetic pyrethroid (SP) group of chemicals, such as Cypafly and Sumifly, was first recorded in 1980. Although no specific work on buffalo fly resistance in the Kimberley has been conducted, SP resistance was considered wide-spread across northern Australia by the 1990s[4].

Although resistance to organophosphates (OPs), such as Supona, was not detected in the same trials, more recent anecdotal evidence suggests that resistance to OPs has since developed[5].

Backlining is the most efficient method of applying chemical as each animal is targeted with a predetermined dose. However, this is labour and cost intensive, requiring cattle to be yarded, with significant investment in time and labour, as well as increasing stock stress levels. Overspraying is also commonly used although this is less targeted than back-lining.

With both these methods repeat treatments are generally not feasible in large herds. There are also significant OHS concerns when handling chemicals in yard situations, particularly with the unskilled labour often available as the only alternative for producers.

A summary of products commonly used to backline and overspray cattle is included in Table 1.

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[4] Rothwell, J. T., Morgan, J. A. T., James, P. J., Brown, G. W., Guerrero, F. D. and Jorgensen, W. K. (2011) Mechanism of resistance to synthetic pyrethroids in buffalo flies in south east Queensland. *Australian Veterinary Journal*, *89* 3: 70-72.

[5] Queensland Department of Agriculture, Fisheries and Forestry, 'Buffalo fly control in cattle', 2013 [http://www.daff.qld.gov.au/animal-industries/animal-health-and-diseases/protect-your-animals/buffalo-fly-control-in-cattle].

Table 1. Common products used to control buffalo fly in northern beef herds.

Product	Method	Concentration	Application	Withholding Period	Export Slaughter Interval
Sumifly	Backline	5:1000	200mL/head	Nil	Nil
Blockade S	Backline	1:250		8 days	21 days
Coopers Easy-Dose	Backline		5mL/100kg liveweight	Nil	21 days
Supona	Overspray	1:50	50mL/150kg liveweight	Nil	
Tixafly	Overspray	1:500	10L/head	Nil	21 days

According to the manufacturer, Tickoff addresses many of the disadvantages associated with currently used methods and is able to treat animals in a more cost-effective and labour efficient manner. The system consists of a buried pressure plate which cattle walk over when accessing water or supplement. As an animal applies pressure to the plate, a measured dose of chemical is sprayed, based on the pressure applied (a function of the animal's weight). This eliminates the need to yard and handle cattle. The unit can be used with any pour-on chemical currently in use to treat cattle for external and internal parasites. The unit is portable and easy to install, therefore able to be used at a number of waters/supplement sites.

The system was trialled at Gardenia Yards on Country Downs station, West Kimberley WA. These yards use a system of spear-trapping cattle on to water in the dry and supplement during the wet. Current buffalo fly treatment consists of a drum filled with Supona™ installed over the out trap. Supona™ is then dribbled onto cattle as they exit the spears. This requires cattle to be kept in yards, and therefore off feed, for a minimum of two days to ensure the majority of animals in the mob are treated.

2 Project objectives

- To assess the economic and labour-saving benefits of using the Tickoff system compared with alternative methods of external parasite control practices (trapping and back-lining).
- To compare the efficacy of the Tickoff system in treating parasite infestations with current management practices.
- To assess the practical implications and benefits of the new delivery system in northern beef herds, particularly with respect to dose control and OH&S issues.

3 Methodology

A Tickoff system was installed on Country Downs station, West Kimberley. Due to seasonal conditions, buffalo fly numbers were insufficient to warrant treatment over the 2011 – 2012 wet season. The trial was extended for a further 12 months, however seasonal conditions were again unfavourable in 2012 – 2013 and no treatment was required.
When designing the trial it was agreed through consultation with the producer, MLA and DAFWAs Animal Ethics Committee that treatment would commence when either

more than 50 flies were observed on an individual animal (+ - 20) or more than 10% of the herd exhibited signs of irritation. Signs of irritation included tail flicking, head tossing, twitching and indications of general discomfort. An example of the scoring sheet which would have been used to monitor animal impact is included in Appendix D.

A number of cattle were weighed and run over the Tickoff system to assess dosage accuracy. Cattle were run through initially to determine coverage of the body of the animal and then again to determine the quantity of liquid dispensed. Water was used in both cases to simulate Supona™ (the chemical control normally used).

A NLIS panel reader was used to monitor animal movements through the trap yard and over the Tickoff apparatus during the 2011 – 2012 and 2012 - 2013 wet seasons. This information was analysed to determine the frequency at which individual animals move through the spears and therefore potentially receive treatment. While this would not prevent multiple treatments it would indicate the severity of the issue.

4 Results

When the volumetric accuracy of the system was tested (using water), results showed Tickoff was not accurate enough to deliver the required dosage. Of the 20 cattle run through the race, 55% were missed completely while 45% received some treatment. Using the recommended dosage of 50ml for each 150kg live weight, application rates ranged from 1 – 42% of the required dose (Table 2). In addition, observations noted that when an animal triggered the mechanism with its front feet, good application was achieved along both sides of the spine (as recommended). However, if an animal only triggered the mechanism with its hind feet, some water was sprayed on the rump area with some water missing the animal completely.

Table 2. Dosage rates of cattle treated with the Tick Off system. Water was used to simulate Supona™ for the purpose of this exercise.

Weight (kg)	Dose (ml)	Required dose (ml)	% of dose
464	Miss	155	0
564	4	188	2
356	3	119	3
350	Miss	117	0
404	2	135	1
297	Miss	99	0
336	10	112	9
261	30	87	34
386	Miss	129	0
316	22	105	21
384	Miss	128	0
274	17	91	19
217	Miss	72	0
308	11	103	11
244	Miss	81	0
276	39	92	42
200	Miss	67	0
277	Miss	92	0
178	Miss	59	0
132	Miss	44	0

In addition, individual animals quickly learned where the system was located and became very good at avoiding stepping on the trigger mechanism.

Animal movements were monitored from the 4th February - 6th April in 2012 and from the 2nd January - 1st February in 2013. A total of 207 animals were recorded in 2012 and 332 animals were recorded in 2013. In both years, cattle appeared to access water in regular waves (Figures 1 and 2), although it should be noted that the monitoring time frames were too short to describe any firm patterns. The timing of rain and maximum day time temperature did not appear to have a major influence on cattle movement patterns.

Figure 1. Percentage of herd recorded by NLIS panel reader each day in 2012.

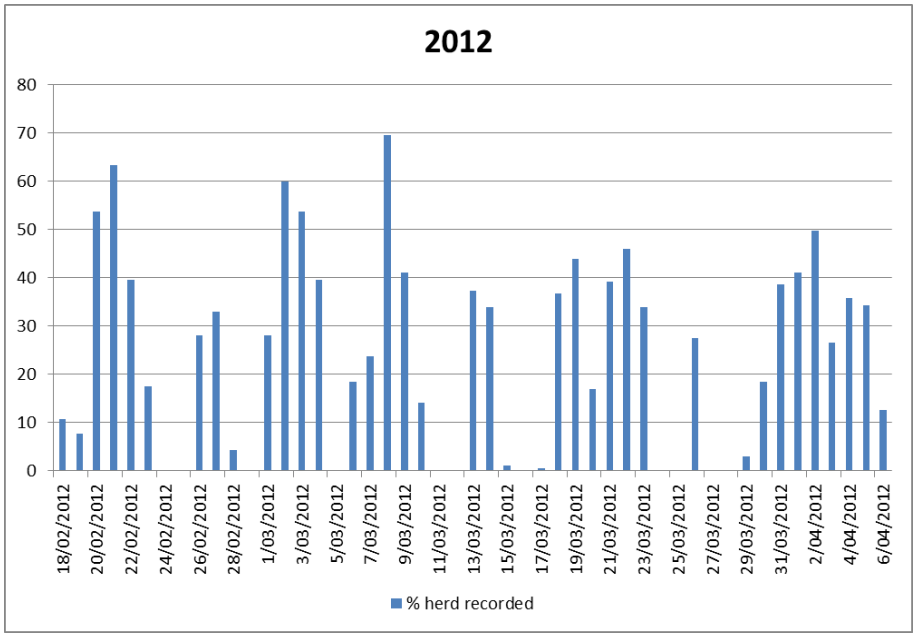
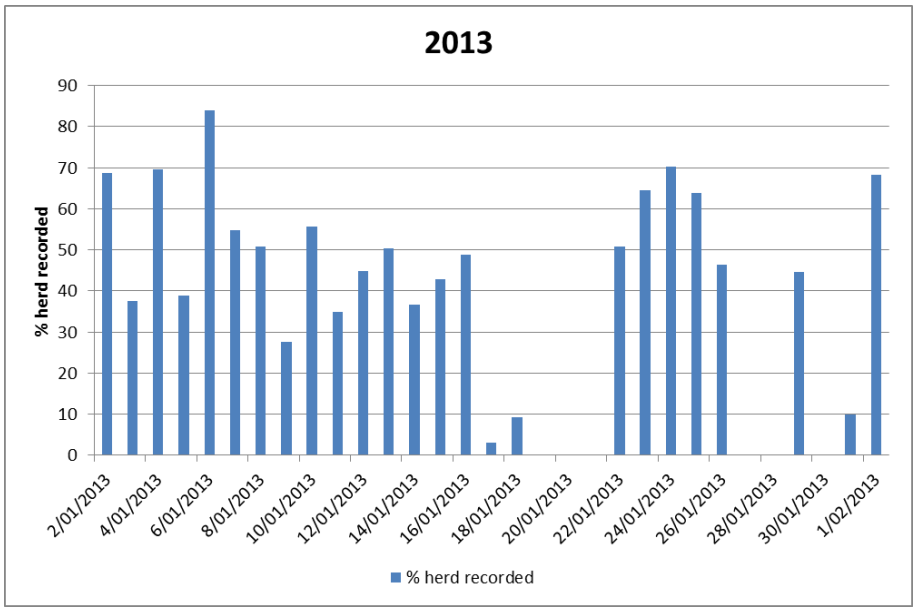


Figure 2. Percentage of herd recorded by NLIS panel reader each day in 2013.



Data were also analysed to determine the frequency with which cattle entered the spear traps. Animal movements were recorded for a total of 48 days in 2012, however due to technical issues full data sets were only collected for 33 days. In 2013, movements were recorded for a total of 31 days, of which 22 days were full data sets.

There was considerable variation between individual animal movements. The number of times an individual animal was recorded entering the traps ranged from 45 to just once in 2012 and 46 and once in 2013. On average, animals visited the yards 15.5 times over 12 days in 2012 and 17.5 times over 12 days in 2013. This equates to an average of 1.3 and 1.5 visits per animal each day, for each day recorded (Table

3). However, as evident from a comparison of the data in Figures 1 and 2 and Table 3, individual animals did not necessarily enter the traps daily, with several days recorded between visits for individual animals.

Table 3. Frequency with which cattle were recorded by the NILS panel reader located on the out spears of Gardenia Yards.

Year	Average no. of visits	Average no. of days accessed	Average visits per day accessed
2012	15.5	12	1.3
2013	17.5	12	1.5

5 Discussion and conclusions

Tickoff is not considered suitable for remotely treating extensive northern beef herds for buffalo fly. The system cannot be relied on to deliver an accurate dose based on the animal's live weight. In addition, Tickoff cannot be relied on to deliver sufficient coverage. Although appropriate application was achieved when an animal stepped on the pressure plate with its front feet, when triggered with the hind feet a good proportion of liquid missed the animal completely.

Due to the irregularity with which cattle access the yards and the inadequate dosage delivered by the Tickoff apparatus, treatment with Tickoff would need to be implemented for extended periods. This would increase the risk of over-treatment of frequent visitors. This could have serious residue implications, and may also result in increased costs due to excess chemical usage. As a result, it is unlikely that Tickoff would deliver any real cost savings.

Under-treatment of animals could also lead to the development of resistant populations of buffalo fly. This would have serious implications for future buffalo fly control programs.

The overall efficacy of the system could not be adequately assessed due to seasonal conditions not favouring buffalo fly populations for the two full wet seasons of the duration of the trial.

The trial suggests that the two major problems of back rubs (not all cattle are treated and the dose per individual animal is unmanaged) are replicated with Tickoff. Therefore, Tickoff appears to offer no advantages over existing control techniques.

6 Extension and communication

Due to seasonal conditions not favouring buffalo fly populations for the two full wet seasons of the duration of the trial, minimal extension and communication activities were carried out. One article '*South African buffalo fly solution not suited to northern Australia*' was published in the Rangelands AgMemo, August 2013. (Appendix B).

7 Acknowledgments

Kurt and Nikki Elezovich are thanked for their commitment to making this demonstration happen – it was appreciated.

8 References

Recommendations for integrated buffalo fly control – Revised Edition, Meat & Livestock Australia, 2011.

Rothwell, J. T., Morgan, J. A. T., James, P. J., Brown, G. W., Guerrero, F. D. and Jorgensen, W. K. (2011) Mechanism of resistance to synthetic pyrethroids in buffalo flies in south east Queensland. *Australian Veterinary Journal*, *89* 3: 70-72.

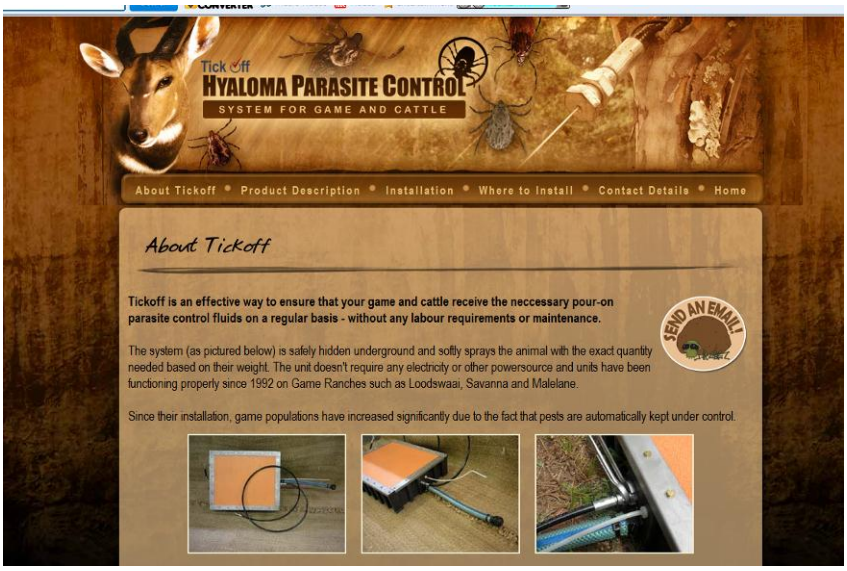
Sackett D and Holmes P, 'Assessing the economic cost of endemic disease on the profitability of Australian beef cattle and sheep producers', Meat & Livestock Australia Final Report AHW.087, 2006.

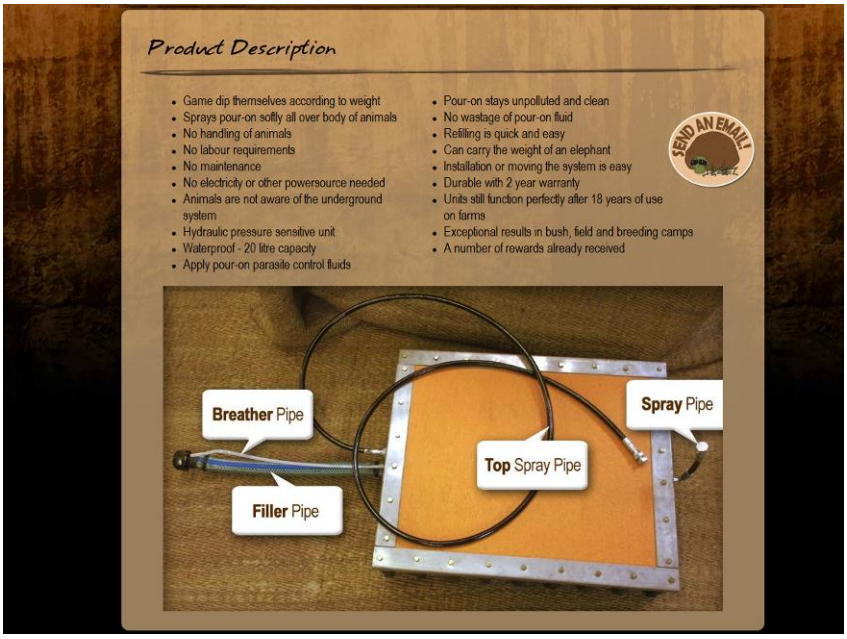
Queensland Department of Agriculture, Fisheries and Forestry, 'Buffalo fly control in cattle', 2013 [http://www.daff.qld.gov.au/animal-industries/animal-health-and-diseases/protect-your-animals/buffalo-fly-control-in-cattle].

Queensland Department of Agriculture, Fisheries and Forestry, 'Production losses of due to buffalo fly in cattle', 2013 [http://www.daff.qld.gov.au/animal-industries/animal-health-and-diseases/protect-your-animals/buffalo-fly-control-in-cattle/production-losses-due-to-buffalo-fly].

9 Appendices

9.1 Appendix A – the Tickoff system





Details of the Tickoff system from the company website http://www.tickoff.co.za/index.html

9.2 Appendix B - Rangelands AgMemo, August 2013

South African buffalo fly solution not suited to Kimberley

Internal and external parasites, particularly buffalo fly, cost the northern beef industry $20-30 million a year (MLA estimates).

Treating buffalo fly infestations can be difficult in extensive northern grazing enterprises due to difficulty of accessing cattle during the wet season.

Paddock-based methods of control include rubs, ear tags and fly traps.

These are useful as cattle can be treated during the wet season when buffalo fly are most prevalent.

Rubs can be effective but not all animals use them and it is impossible to control the dose any one animal receives.

A potential solution to this problem was Tick Off, a relatively simple piece of equipment that consists of a pressure plate and two dispensing nozzles.

The idea is to bury the pressure plate in an area cattle must walk over.

As the animal steps on the plate, a bladder is compressed and treatment is dispensed through the nozzles, with the dosage being determined by the animal's liveweight.

Tick Off is widely used in South Africa to treat beef herds and wild game, where claims are made it can accurately treat a range of animals from a springbok to a rhino.

Kurt Elezovich, of Country Downs station, agreed to trial Tick Off in an MLA funded Producer Demonstration Site.

Country Downs was ideal as it has very little surface water and cattle are used to accessing water and supplement through spear traps.

Tick Off was installed in the out-trap at Gardenia Yards during the latter part of the 2010/11 wet season.

Due to seasonal conditions, buffalo fly numbers were not sufficient to warrant treatment over the 2011/12 wet season.

The trial was extended for a further 12 months, however seasonal conditions were again unfavourable in 2012/13 and no treatment was required.

As a result, it was impossible to determine how effective Tick Off was at controlling buffalo fly, although early observations in 2010/11 suggested the system was at least as effective as traditional control methods.

In order to test Tick Off's accuracy, a number of cattle were weighed then run through the race with water being used to determine dose rates and effective application.

Unfortunately, the results showed that Tick Off was simply not accurate enough.

Of the 20 cattle run through the race, 55% were missed completely while 45% received some treatment.

Using the recommended dosage of 50ml for each 150kg live weight, application rates ranged from 1-42% of the required dose.

In addition, when an animal triggered the mechanism with its front feet, good application was achieved along both sides of the spine (as recommended).

However, if an animal only triggered the mechanism with its hind feet, some water was sprayed on the rump area with some water missing the animal completely.

In addition, individual animals quickly learned where the system was located and became very good at avoiding stepping on the trigger mechanism.

Another potential problem with Tick Off is the number of times individual animals passed through the spears in a given period.

In order to get a handle on this, a NLIS panel reader was installed next to the out-trap and individual visits were recorded from the 4 February to 6 April in 2012 and from the 2 January to 1 February in 2013.

A total of 207 animals were recorded in 2012 and 332 animals were recorded in 2013.

In both years, cattle appeared to access water in regular waves (Figure 1), although it should be noted that the monitoring time frames were too short to describe any firm patterns.

The timing of rain and maximum day time temperature did not appear to have a major influence on cattle movement patterns (Figure 2).

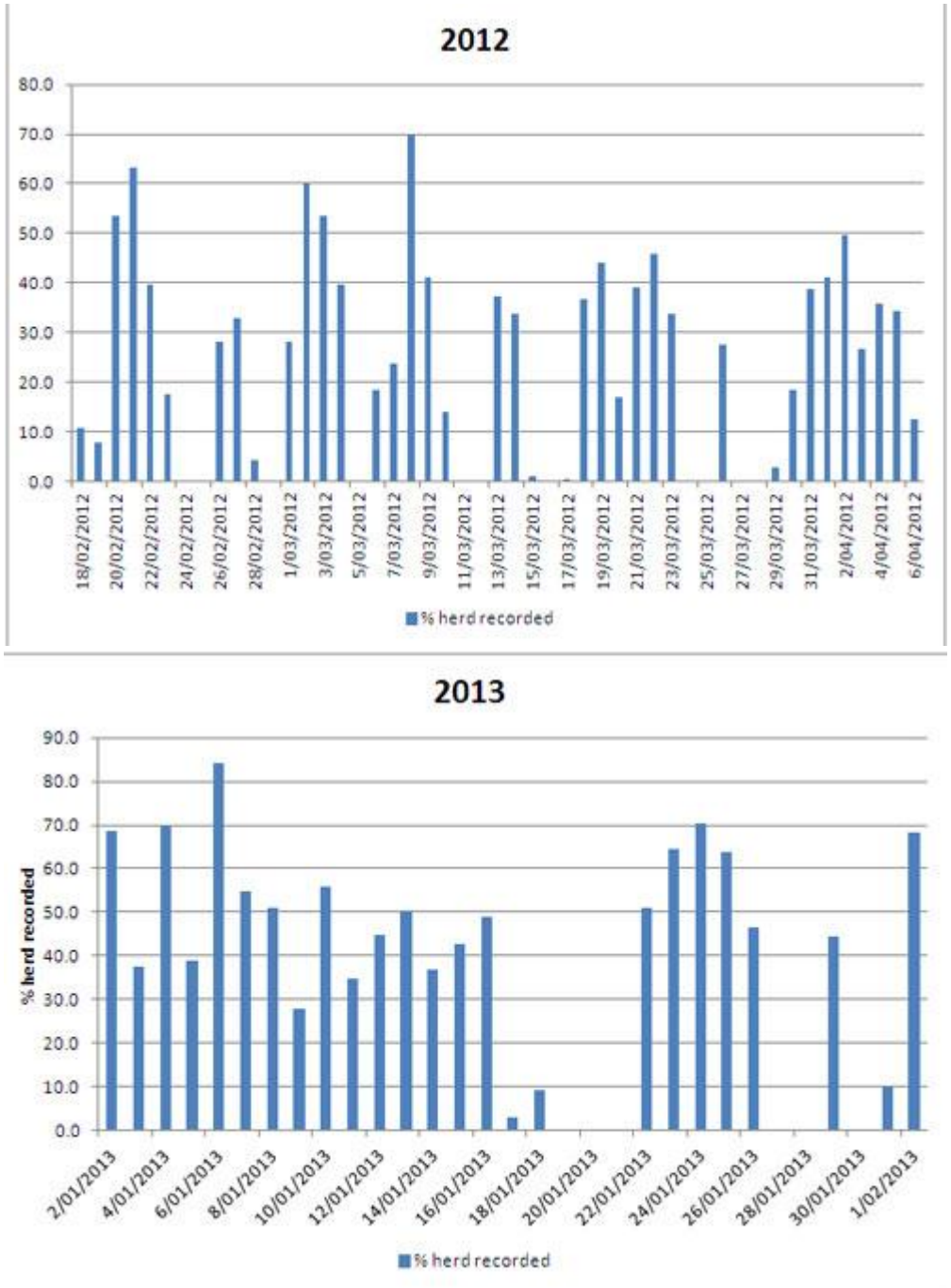


Figure 1 Percentage of herd recorded by NLIS panel reader each day

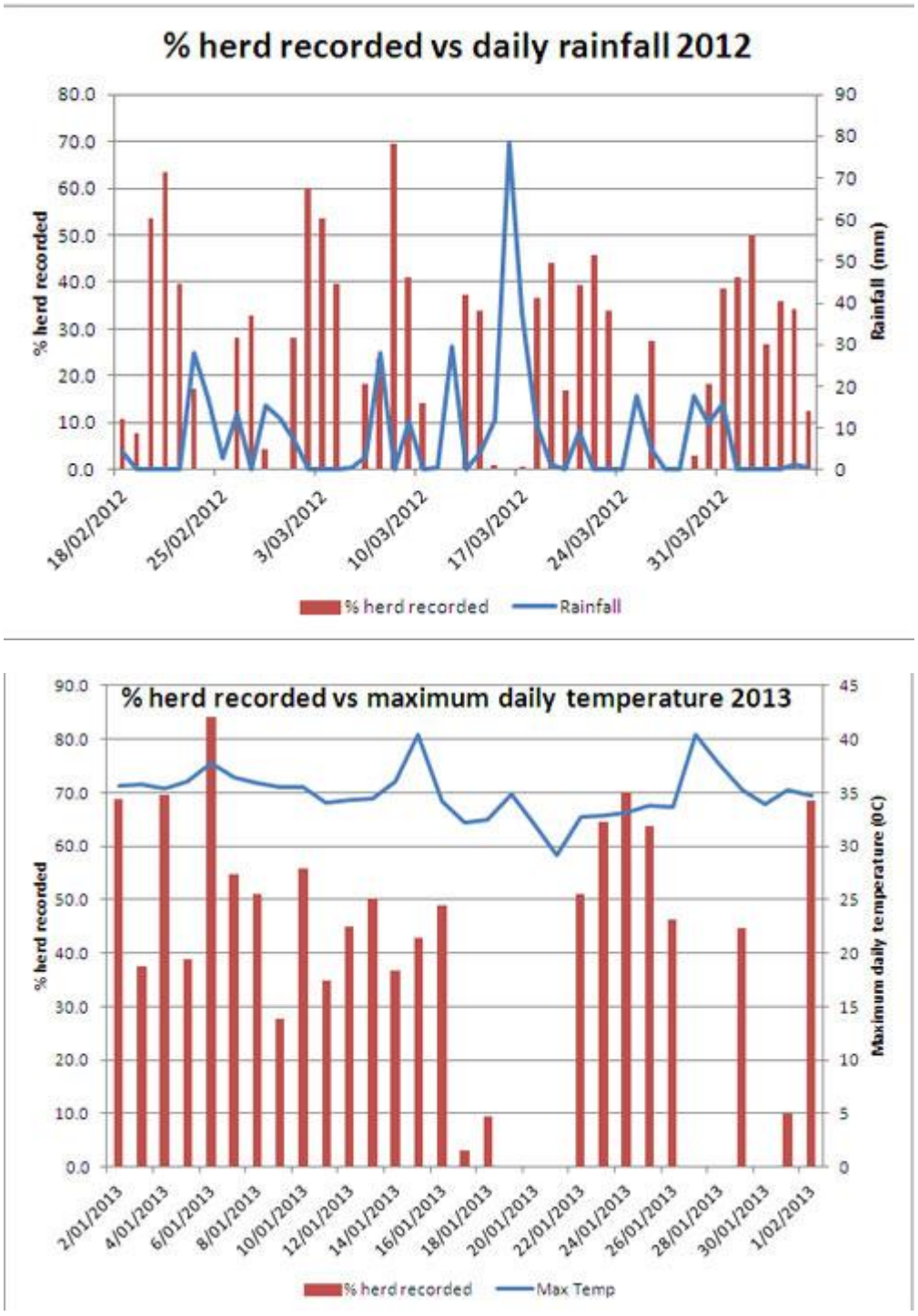


Figure 2 Percentage of herd recorded each day in 2012 and daily rainfall and percentage of herd recorded each day in 2013 and maximum daily temperature (weather data source Bureau of Meteorology)

There was considerable variation between individual animal movements.

The number of times an individual animal was recorded entering the traps ranged from 45 to just once in 2012 and 46 and once in 2013.

On average, animals visited the yards 15.5 times over 12 days in 2012 and 17.5 times over 12 days in 2013.

This equates to an average of 1.3 and 1.5 visits per animal each day, for each day recorded.

However, as evident from a comparison of the data in Figure 1 and Table 2, individual animals did not necessarily enter the traps daily, with several days recorded between visits for individual animals.

As a result of the above, Tick Off is not considered suitable for remotely treating extensive northern beef herds for buffalo fly.

The system cannot be relied on to deliver an accurate dose based on the animal's live weight.

In addition, Tick Off cannot be relied on to deliver even coverage of individual animals.

The trial suggests that the two major problems of back rubs (not all cattle are treated and the dose per individual animal is unmanaged) are replicated with Tick Off.

Therefore, Tick Off appears to offer no advantages over the existing treatment techniques.

For more information contact Anne Marie Huey, Development Officer, Broome, 9191 1428.

Photo (main): Tick Off at work

9.3 Appendix C – Photos from the PDS

Photo 1 - Kurt burying the pressure plate.

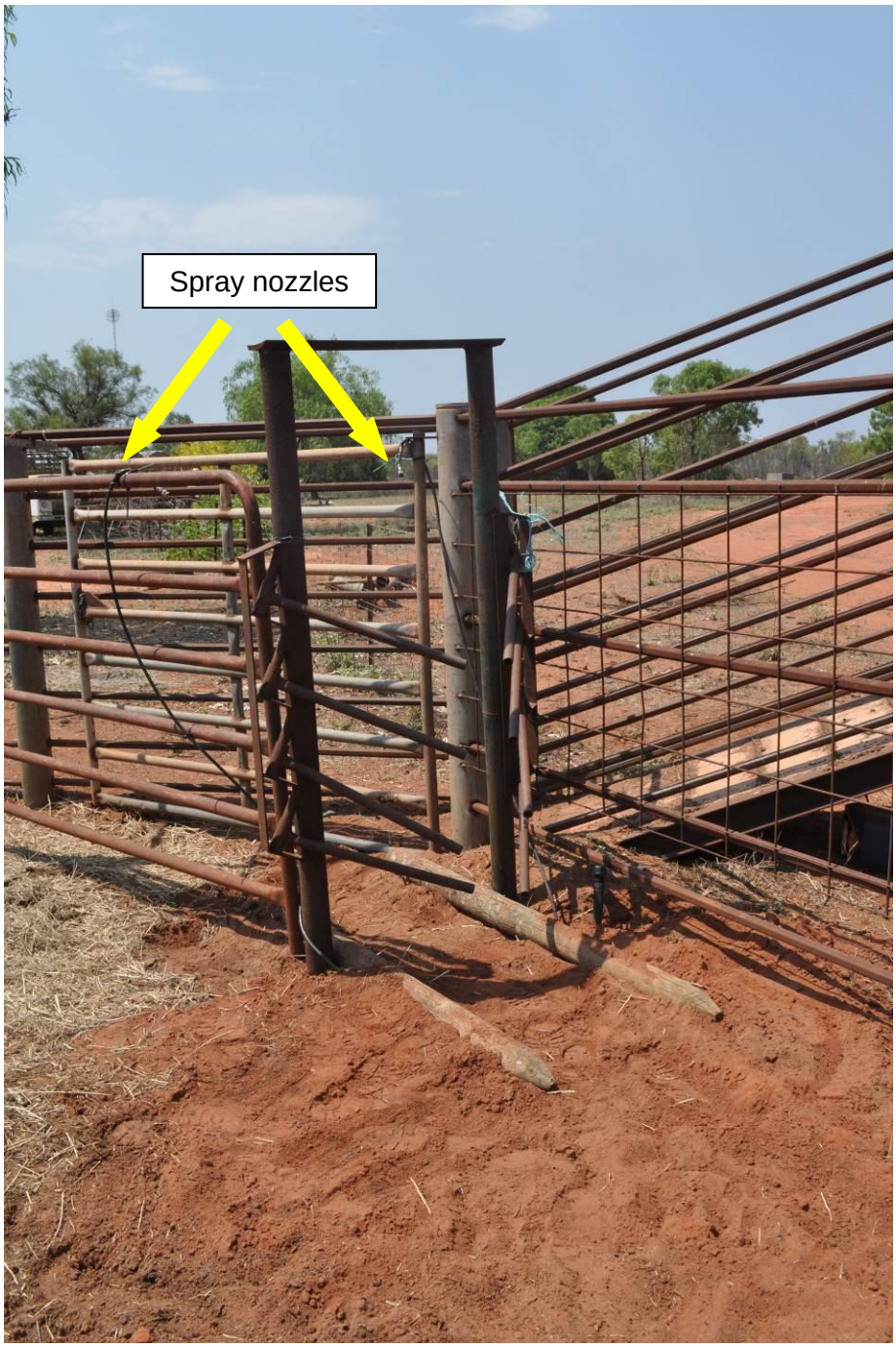


Photo 2 – The Tick Off system in situ. The trigger mechanism is buried between the two logs. The spray nozzles attached to the rails.

Photo 3 – Bull getting good coverage

Photo 4 - Cow hitting plate with her back foot and getting poor coverage

Photo 5 - Cow avoiding the pressure plate completely

9.4 Appendix D – PDS scoring sheets

Scoring sheet designed to measure the impact of buffalo fly on the herd. Treatment would have been triggered when an individual animal was observed to have greater than 50 buffalo fly present, or more than 10% of the herd exhibited signs of irritation.

Paddock	
Treatment	

No of cattle observed	

BUFFALO FLY	
Date of last treatment	
Supona	

Fly numbers on individual animals	**No of head affected**
0-10	
11-20	
21-50	
51-100	
100-200	
>200	
Signs of irritation	**% herd**
Tail flicking	
Head tossing	
Twitching	
Comments	