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The Impact of diptank rehabilitation on the occurrence of Ticks and tickborne diseases in Umzingwane District, Matabeleland South, Zimbabwe

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Abstract: *The objective of this study was to determine the impact of diptank rehabilitation on the prevalence of ticks, tick borne diseases (TBDs) and other tick related conditions in Umzingwane district of Zimbabwe. About 120 cattle farmers and three veterinary officers were randomly interviewed using a structured questionnaire. Before diptank rehabilitation programme, 70% of the farmers owned an average of 7 cattle and handling facilities were not intact. Furthermore, they were no footbath, no roof and head clump. As a result, all the farmers reported poor tick control due to the fact that cattle were escaping from the handling facilities before dipping. About 55% farmers lost cattle due to tick related conditions before diptank rehabilitation resulting in 17% cattle mortality. About 57% cases of tick borne diseases were reported and 70% farmers reported that their cattle suffered from teat and udder damage, abscess and screwworm wounds due to tick infestation. As a result 78% farmers resorted to the use of alternative dipping remedies such as used engine oil (45%), hand spraying (18%), and hand pulling (15%). In the period of 2009/10, the communal diptanks were rehabilitated by Stabex 95 programme. All the respondents reported that diptank rehabilitation improved effective dipping, eased up the carrying of other management activities and improved their herd productivity. Also, diptank rehabilitation resulted in reduction of tick infestation (80%), TBDs (75%), abscesses (95%), screwworminfestation (65%), calf mortalities (78%). Furthermore, about 83% of farmers owned an average of 13 cattle. The study revealed that diptank rehabilitation improved cattle productivity.*

Key words: acaricide, handling facilities, tick infestation, Stabex 95

I. Introduction

Tick infestation and Tick Borne Diseases (TBD) are important conditions that affect livestock health and productivity in Zimbabwe (Ndhlovu *et al*., 2009). In Matabeleland South province, particularly, some work done by VEDMA Consulting Group in 2005 confirmed that tick infestation and tick borne diseases are some of the most important conditions affecting livestock productivity (Ndhlovu, 2008). Ticks are responsible for the direct damage to livestock hides through feeding habits and the damage is manifested inhides, udder, teats, scrotum and myasis due to infestation (Ndhlovu *et al*., 2009). Moreover, ticks are responsible for the transmission of a large variety of diseases that affect livestock. The major diseases include; babesiosis, anaplasmosis, theileriosis and ehrlichiosis. Furthermore they cause tick worry, irritation, weight loss due to massive infestation of ticks, and loss of blood due to feeding ticks (Moyo *et al*., 2009).

In order to improve livestock productivity, effective tick control measures should be taken. The most popular method of tick control is application of the acaricidedirectly to the animal host. It is important that application techniques be thorough and that the acaricide be highly effective against ticks without injuring the host. According to Moyo (2008), the usual way of treating large numbers of animals is to dip them in a plunge dip. Control of ticks and tick borne diseases in smallholder areas has been the major activityof the Department of Veterinary Field Services (DVFS) (Ndhlovu, 2008). The effective tick control involves the use of a well-constructed and approved diptank by the department of veterinary services. The basic components of a diptank include the race, holding pen, forcing pen, plunge and drainage area or pen. The race, holding pens and forcing pens should be intact to avoid cattle from escaping before they dip. Forcing pen allows cattle to enter the diptank area one at a time. Diptanks should be properly maintained to ensure effective cattle dipping to prevent tick infestation. The objective of this studytherefore was to determine the impact of diptank rehabilitation on the prevalence of ticks, tick borne diseases and other tick related conditions in Umzingwane district of Zimbabwe.

II. Materials and Methods

The study was conducted in Umzingwane district in agro-ecological region IV and V Matabeleland South. Umzingwane is one of the six districts in the drought stricken Matabeleland South province consisting of 20 wards. Rainfall is erratic with an average of 650mm per annum, with high temperatures (25-32° C), (Phiri,

2011). The area has an altitude of 1,186m above sea level and lies within the latitude of $20^0$19'60" S and longitude of $28^0$57'0"E. There are six Animal Health Management Centres (AHMC), in the communal area of Umzingwane district. Three AHMCs (Mawabeni, Esibomvu and Sigola) were randomly selected, and two diptanks, per AHMC were selected, one with the lowest and the other with the highest number of cattle. The sampled diptanks include Mzola, Glenlategen, Mahanka, Ntola, Duncal and Mzingwane. Systematic random sampling method was used to select 20 stockowners per diptank to participate in the survey where, 30% of the population was sampled. Before the commencement of the program all the stakeholders to be involved were consulted, those being Umzingwane Rural District Council (URDC), Local Government, and DVFS. The Animal Health Inspectors, the Veterinary Livestock Technicians and Dip Attendants were trained on different topics some being record keeping and the dimensions of the diptank handling facilities. The communities were consulted, before implementation of the project to ensure sustainability and ownership. The survey was conducted by use of semi structured questionnaires. Formal interviews were held with the selected farmers and discussions were held with focus groups, those being the Livestock Development committees (LDCs). A total of 120 semi structured questionnaires were administered to the cattle owners for data collection. The survey questionnaires used in this study had both closed and open ended questions. This was done so that the questionnaire includes some open-ended questions which require written commentaries which would provide sufficient data on which to comment on rather than relying only on coded data which would become condensed into brief summaries when analyzed with statistics packages. The data collected include the household demographics, importance of cattle, cattle ownership, prevalent diseases, the most problematic external parasite, cattle management practices as well as changes experienced before and after the rehabilitation of dip tank handling facilities. Secondary data on the cases of tick borne diseases was obtained from the annual reports of the DVFS Umzingwane district, the department that facilitated the Diptank rehabilitation program.

Statistical analysis

Data was analysed using Statistical Package for Social Sciences version 16.0 (SPSS). Descriptive statistics and cross tabulations were computed. A paired sample T-test was used to compare the two means that is the means for TBD cases before and after rehabilitation.

III. Results

Most households were headed by men (85.8%), who also owned cattle, 14.2% were headed by women, who also owned cattle. Of the cattle owners, 48.3% were aged between 60-80years, 30.8% aged between 40 and 60years, 13.3% between 20 and 40 years and 7.5% were aged between 80 and 100 years. There were male farmers only in the age ranges of 20-40 and 80-100, female farmers only appear in the age arranges of 40-60 and 60-80. The majority of the respondents (32.5%), went up to standard six, Ordinary level (27.5%), standard three (14.2%), Zimbabwe Junior Certificate (ZJC) (10.8%) and grade seven (14.2%), with a few (0.8%) who went up to tertiary level. The highest number of respondents (70%), owned between 1-10 cattle with an average of 7 cattle, before rehabilitation. The numbers of animals varied with years as shown in Table 1. Of the farmers interviewed 50% valued cattle for draught power, milk, and manure whilst the other 50%, in addition of the above valued cattle for sale. In all sampled areas cattle are herded, mostly by boys (51.7%), fathers (35%) and 8.3% are herded by mothers, while in other households cattle herding is alternated between fathers and mothers or mothers and boys. Table 2 shows the management activities carried by the interviewed farmers on cattle.

External parasites and their effects

According to the farmers interviewed ticks are the most problematic external parasites. The farmers control ticks through communal plunge dipping using commercial acaricides supplied by the government. Cattle are dipped weekly in summer and fortnightly in winter. About 55% of farmers lost cattle due to tick related conditions in the past 5 years with the following mortalities: Glenlatagen (10%), Mzola (6.7%), Mzingwane (8.3%), Duncal (9.2), Mahanka (10%) and Ntola (10.8%). A total of 43.3% respondents did not experience any cases of Tick borne diseases, 52.5% experienced between 1-5 TBD cases, and 4.2% experience between 5-10 TBD cases (Table 3), with specifics for each diptank. Of the interviewed farmers 50% indicated that blackleg and heart water are the most prevalent diseases, the other 50% reported that the most prevalent diseases in the area were heart water, sweating sickness and blackleg. Most mortalities were perceived to be due to TBDs (83.3%) and blackleg (16.7%).

STABEX 95 Diptank Rehabilitation program

About 50% of the respondents highlighted that before the program, handling facilities were not intact, and there was no head clump at the race, and the other 50% respondents, mentioned that handling facilities were not intact and there was no footbath (Table 4). According to the interviewed farmers (66.7%), the components which were rehabilitated include the race, holding pens, forcing pens, footbath, dripping pens and plunge roof,

whilst 33.3% farmers indicated that the race, holding pen, forcing pen, footbath and head clump were rehabilitated.

Challenges before the rehabilitation programme

All the respondents reported that before the diptank rehabilitation programme, there was poor tick control andthey experienced difficulties in controlling cattle during dipping operation. Some cattle were escaping before dipping and it was also difficult to carry out other management practices like vaccinations, deworming, inspections and branding as there was no race or it was not up to standard. Some diptanks had no roof to reduce water loss due to evaporation and to prevent excessive fill from rain water. Most farmers (66.7%), reported tick infestation was moderate and however, 33.3% testified heavy infestation levels. Those who reported heavy infestations perceived that some cattle would escape from the handling facilities before they dip, then undipped cattle became the tick breeding ground. Before diptank rehabilitation, 78% farmers resorted to the use of alternative dipping remedies such as used engine oil (45%), hand spraying (18%) and hand pulling (15%). All farmers alleged that before diptank rehabilitation ticks were problematic by spreading tick borne diseases which caused death of most cattle, caused teat and udder damages, abscesses as well as wounds which resulted in screw worm infestation on their cattle.

Changes experienced after the rehabilitation of diptank handling facilities

All the farmers reported there are positive changes experienced after the rehabilitation of diptank handling facilities. About 83% of the respondents confirmed that the changes brought about by the program included; ease in controlling and dipping of all cattle brought to the diptank, decrease in TBDs (Figure 1), reduction in tick infestation levels, reduction in expenses of treating TBDs, reduction in TBD related mortalities as well as reduction in calf loses, 16% indicated an improvement in the dipping system, thus effective tick control. Table 5shows changes experienced by famers after the diptank handling facilities were rehabilitated. The LDCs were trained on common livestock diseases and on diptank management. All the respondents reported that diptank rehabilitation improved effective dipping and eased up the carrying of other management activities such as dehorning, castration, vaccinations and branding, as a result cattle are in good condition and have improved productivity. In addition, all the respondents appreciated the wise decision by the government and NGO to carry out the rehabilitation exercise.

IV. Discussion

Cattle are valued mostly for draught power, milk, manure and for sale, in the communal areas of Umzingwane district, this is in agreement with a research done by (Chimonyo *et al*., 1999; Palmer and Ainslie 2006; Marufu, 2008), which confirms that cattle provide draught power for crop production, hides, manure, dung, meat, milk and cash through sales. In the current study ticks were found to be the most problematic external parasites of cattle, and this confirms with Hesterburg *et al*. (2007) who reported that ticks and TBDs are ranked by farmers as the most important health constraint in their cattle production.

All the farmers interviewed used the communal plunge dip to control external parasites, this in agreement with a study carried out by Moyo (2008), who found farmers in communal areas used conventional acaricide and dipping tanks provided by the government to control ticks, as the main tick control method. Communal plunge dipping is used to control ticks as it is the most conducive way of dipping large numbers of cattle, and the most efficient and economic method for periodically treating a very large number of animals against ticks**,** flies**,** mites**,** lice and other external parasites (Janguera, 2013). Farmers in the study area are dipping their cattle weekly in summer and fortnightly in winter and it is agreement with Ndhlovu *et al*. (2009), who reported that strategic dipping entails weekly dipping of cattle during periods of high tick activity in the months of November to April and either fortnightly or monthly dipping during the other months. Heart water, sweating sickness and blackleg were found to be the most prevalent diseases in the area, with high mortalities being due to TBDs and blackleg. Incidences of blackleg disease were high, because farmers were not able to buy vaccines, and for those who vaccinated the reason could be poor vaccine handling during vaccinations, that's failure to maintain the cold chain. In some cases cattle were improperly vaccinated and some were missed due to poor handling facilities. High incidence of TBDs before diptank rehabilitation was due to ineffective dipping caused by dilapidated dipping facilities and dirty dipwash. All the sampled diptanks were rehabilitated under the STABEX 95 program. According to Ragwa (2013), 'Top down' approaches through which governments and other experts have identified and imposed solutions have failed in the past to resolve these intractable problems. The purpose of involving communities was to ensure that farmers contribute to their own development (Scheepers, 2000). Bhatnagar *et al*. (1992) explains that community participation is a proven approach to addressing community development issues and has long been utilized in projects varying from sanitation to child survival, clean water production, and health infrastructure. The LDCs were trained on common and notifiable diseases as well as on diptank management. The training empowered the LDCs

technically and it also improved the literacy levels which resulted in improved communities. In the rehabilitation process, the farmers provided labour whilst STABEX 95 provided materials for rehabilitation of diptank handling facilities as well as roofing the plunge, some diptanks were provided with water pumps and head clumps, this is in agreement with Gabella (2009)'s findings, the sponsoring organization provides all the materials to be used while communities supply labour. Acaricides, blackleg and lumpy skin diseases vaccines were issued to the farmers under the program whilst DVFS was issued with Veterinary kits, which include the automatic syringes, dosing guns amongst others. Provision of the acaricides ensured adequate dipping which reduced the tick infestation levels. Vaccination of cattle against blackleg and lumpy skin diseases improved the cattle productivity and reduced cattle mortality. Provision of veterinary kits to the DVFS improved the service delivery to the farmers, who had no money to purchase their own veterinary kits. In addition, it ensures that the cattle management activities such as dehorning, castration and deworming are carried out.

Before the diptank handling facilities rehabilitation, farmers experienced difficulties in controlling cattle into the plunge for submersion, some would escape from the handling facilities which were not intact. Broken down exit gates of drying pens, made it difficult to contain animals to dry. As a result dip wash was lost resulting in more water being needed to replenish the tank. In addition, the floors of some diptanks were broken leading to further loss of dip wash. Given the problem of water availability in the district, these losses were an important constraint to diptank management. It was also difficult to carry out other management activities like vaccinations and deworming which are easier done at the race. Now that the handling facilities are intact cattle are no longer escaping, all cattle brought to the diptank are successfully dipped. With the correct dipwash strength and all other dipping rules in place, tick control becomes effective. This is in agreement with the findings by Tice *et al*. (1998),which states thatif there is a dip tank available and it is functioning the cattle are usually presented for dipping at the correct interval and dipped efficiently (once every 7-14 days). In areas where heavy tick infestation were reported, it was perceived to be due to those cattle that missed dipping sessions by escaping thereby providing the tick breeding ground.

Before diptank rehabilitation heavy tick infestation caused farmers to resort to alternative tick control measures which aimed at reducing tick infestation levels. Farmers used alternative measures such as tick grease, hand spraying with acaricides, used engine oil, hand pulling, use of a pliers to pinch the ticks and chickens also helped by picking ticks on cattle (Moyo and Masika, 2009). Moyo (2008) revealed that chickens remove ticks from recumbent cattle in the morning hours as well as ingesting engorged adult ticks that have dropped off to the ground, whereas Chamboko, *et al*. (1999) reported 6.9% of Lowveld smallholder farmers and 28.3% of Highveld farmers in Zimbabwe removed ticks from their cattle by hand. Previous studies, Masika *et al*. (1997); Mbati *et al*. (2002) and Moyo and Masika (2009) reported similar findings that farmers reduce tick load infestation using old engine oil and manual removal of ticks. However, the safety of used engine oil to animals and meat consumers is not known. Ticks were problematic before the rehabilitation of handling facilities, they spread diseases to cattle, caused high cattle mortalities, udder and teat damages leading to loss of calves and loss of breeding stock, by having heifers and cows' teats damaged or bulls' scrotum or penis being damaged by ticks, In a research done by Ndhlovu *et al.* (2009), of the 286 milking cows and heifers sampled, 53 % had some degree of udder and/or teat damage. The rehabilitation of diptanks handling facilities facilitated effective dipping as farmers can now manage to dip all cattle without having some escaping, the dipping process is no longer stressful to farmers, there is reduction in cases of TBDs and hence reduced expenses of treating the tick borne diseases cases. This is in agreement with Gabella (2009), who reported that the rehabilitation of existing dip tanks improves access by livestock to dipping facilities thus animal health is improved due to the reduction of tick borne diseases.An economic gain in terms of milk and sale of cattle which are in good condition, decrease in cattle mortalities which are due to TBDs as well as reduction calf loses.

According to the farmers the impact of diptank rehabilitation on cattle production include effective dipping and tick control, ability to carry out other management activities such as deworming, castration, vaccinations, branding and dehorning. It is now easy to handle cattle in the race and head clump in those diptanks where head clumps were installed. A social benefit is being experienced to those diptanks where water pumps were installed, it is no longer strenuous or laborious to fill the plunge with water especially after cleaning it, as some plunges have a capacity of about 20 000litres of water. Some diptanks had no footbath before rehabilitation, which resulted into a lot of mud entering in the diptank, thus reducing the efficacy of the target dipwash. The acaricides tend to bind to particles of dirt, hair and dung that enter the plunge thus weakening the strength of the dipwash increasing the stripping rate (Moyo and Masika, 2009). Rehabilitation of water reticulation and supply of water pumps enabled regular cleaning of the plunge dip which is very important so as to remove the accumulated sediments (Moyo, 2008). In addition, rehabilitation of water supply and water pump played a pivotal role, because prior to the rehabilitation many cattle owners were reluctant to participate in the supply of water to the diptanks mainly because of the drudgery of ferrying water manually, the distances involved and generally old aged and poor health of the farmers. By roofing the plunge, rain water was impede from entering the plunge and over filling it, which will require the farmers to remove excess water. At the same

time roofing reduces the evaporation of the dipwash. The farmers (100%) confirmed that it was necessary for government and the NGO to rehabilitate the diptanks, because they could not do it on their own due to lack of funds and knowledge, and it has improved on cattle production. To improve the dipping system or livestock productivity furthermore, farmers need assistance of bull donations, installation of water pumps or boreholes to those diptanks which do not have them, toilets at the diptank, as well as a constant supply of acaricide. The results of a T-test shows that diptank rehabilitation had an impact on the prevalence of tick borne diseases as it improved cattle access to dipping facilities hence effective tick control was improved thereby reducing tick infestation and the occurrence of Tick borne diseases.

V. Conclusion

Rehabilitation of dip tanks has positiveimpact on effective cattle dipping and on the prevalence of tick borne diseases. The study also revealed that due to the rehabilitation of diptanks, tick control has improved because of improved access of cattle to a dipping facility, the plunge. Improvement in tick control led to reduction in TBDs and the rehabilitation of the race enabled the carrying of other management activities, thus improvement in animal health and production. Further it was established that the socio-economic status of farmers was improved due to reduction in expenses of treating for TBDs as well as reduction in cattle mortalities.

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Table 1: Number of cattle owned by respondents from 2009 to 2012

Year	Number of cattle	Percentage of Respondents
2009	1-5	39.2
	6-10	36.7
	11-15	15
	16-20	6.7
	21-25	2.5
2010	1-5	37.5
	6-10	36.7
	11-15	16.7
	16-20	4.2
	21-25	4.2
	26-30	0.8
2011	1-5	32.5
	6-10	40
	11-15	14.2
	16-20	7.5
	21-25	1.7
	26-30	4.2
2012	1-5	29.2
	6-10	37.5
	11-15	20.8
	16-20	5.0
	21-25	3.3
	26-30	3.3
	31-35	0.8

Table 2: Groupedmanagement activities carried out on cattle by farmers of Umzingwane district

Cattle management Activities	Diptank						
	Glenlatagen	Mzola	Mzingwane	Duncal	Mahanka	Ntola	Total
Herd, vaccinate, deworm, dehorn	11.7%	10%	12.5%	11.7%	10.8%	10%	66.7%
Herd, vaccinate, castrated, dehorn	2.5%	3.3%	0.8%	4.2%	2.5%	4.2%	17.5%
Herd, vaccinate, castrate, deworm	2.5%	3.3%	3.3%	0.8%	3.3%	2.5%	15.8%

Table 3: Number of Tick borne diseases (TBD) cases encountered by respondents 5 years before rehabilitation

TBD cases encountered by farmers.	DIPTANK						
	Glenlatagen	Mzola	Mzingwane	Duncal	Mahanka	Ntola	Total
0 cases	7.5%	7.5%	8.3%	6.7%	6.7%	6.7%	43.3%
1-5 cases	7.5%	9.2%	7.5%	8.3%	10%	10%	52.5%
5-10 cases	1.7%	0%	0.8%	1.7%	0%	0%	4.2%

Table 4:State of Diptanks before rehabilitation program

CHARACTER	DIPTANK						
	Glenlatagen	Mzola	Mzingwane	Duncal	Mahanka	Ntola	Total
Handling facilities not intact, no head clump	0	16.7%	16.7%	16.7%	0	0	50%
Handling facilities not intact, no footbath	16.7%	0%	0%	0%	16.7%	16.7%	50%

Table 5: Changes experienced by farmers after diptank rehabilitation

Benefits	Percentage of Respondents
Socio-economic benefits, effective tick control	83.3
Effective tick control	16.7

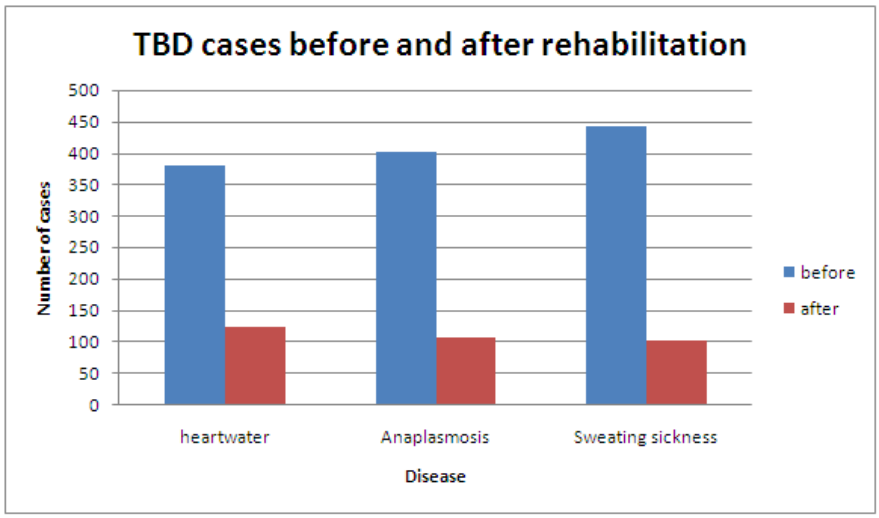

Figure 1. Shows the number of TBDs before and after the rehabilitation program