REPORT ON VETERINARY NEEDS ANALYSIS IN MZWAKAZI AND MTWENI, EASTERN CAPE FOR TRANSKEI ANIMAL WELFARE INITIATIVE

INTRODUCTION

The Faculty of Veterinary Science, University of Pretoria was approached by the Transkei Animal Welfare Initiative (TAWI) to investigate the veterinary needs in two rural villages near Port St Johns, where TAWI is based, in order to determine what the best strategic approach to promoting animal welfare would be. The organisation was particularly interested in the prevalence of helminthic zoonoses. These two villages had not yet been serviced by TAWI apart from engaging with the community leaders in order to obtain approval for this project. The project was financed through the cat and dog food company Royal Canin.

Two adjacent communities were visited – 38 home/dog owners in Mzwakazi and 13 in Mtweni (51 in total) participated in interviews, and biological samples (faeces and external parasites) were collected from 97 dogs (77 faecal samples, 74 ectoparasite samples) of which 75 were from Mzwakazi and 22 from Mtweni. The area is approximately 10 km out of Port St John's along the Lusikisiki road. The only veterinary presence in these communities was one state vet rabies vaccination and deworming campaign about 3 months prior to our visit.

DATA COLLECTION

Four veterinarians, four veterinary students, three volunteers and two TAWI staff members (including an interpreter) divided into two groups who visited the area over a two-week period (one group from 7-10 July 2014 and one group from 14-18 July 2014). The groups each walked from house to house, interviewing one family member (usually the most senior person present at the time of our visit) per homestead. This person, on our arrival, was first given an explanation for our visit and asked for verbal permission to continue with the questionnaire, take samples from the dog and to take photographs. All the communication occurred through an interpreter who comes from the region and works as an SAVC-authorised animal welfare assistant for TAWI. Participants were informed that participation was entirely voluntary and that they could withdraw from the process at any point. Not one community member refused or withdrew from the process and the teams were generally well accepted and made to feel welcome by the communities.

An adapted version of Minnaar's (2001) questionnaire was used and questions were asked and recorded by one team member, with the help of the interpreter.

For the biological samples, dogs were mostly caught and held by family members while a team member applied a nylon muzzle and then proceeded to restrain the dog either in a standing position if it was possible, or in lateral recumbency on the ground, without any help from bystanders. It was more efficient and humane for one experienced dog handler to restrain each dog with the minimal restraint necessary than have the owner(s) of the dogs restrain them. A faecal sample was obtained from each dog (a few dogs did not have faeces in the recturm) and kept in small plastic ziplock bags in a polystyrene cooler box. Each day's samples were kept in a fridge until the end of the week and were then transported by a team member to Pretoria to the Parasitology Laboratory at the Faculty of Veterinary Science, University of Pretoria where faecal flotations were performed. Ticks (excluding engorged female ticks) as well as some fleas were also collected with forceps and stored in glass or plastic bottles in 70% ethanol. These were identified with the help of Prof Ivan Horak from the Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria.

RESULTS - QUESTIONNAIRES

GENERAL INFRASTRUCTURE

The majority of homes in these two rural areas do not have access to piped water or sanitation but do have electricity which is used mainly for lighting, as wood fires are the most common cooking method. The water is fetched daily in buckets from the nearby river. Some of the homes have water tanks in which they collect rain water. The spoken language is Xhosa. The majority of homes are built with mud and sticks, and 47% of households interviewed have no access to sanitation (using the bush as a toilet). The remaining 53% have access to outside "long drop" toilets.

ANIMALS OWNED PER HOUSEHOLD

On average, each household owned 3,4 dogs (ranging from 1 to 9). Only two households did not own other species, with the majority of families (65%) having chickens. See Table 1 for a breakdown of other species owned.

Table 1: Percentages and numbers of households owning species other than dogs

Species owned	Percentage	n
Chickens	65%	33
Goats	43%	23
Cattle	41%	21
Pigs	33%	17
Cats	24%	12
Donkeys	10%	5
Geese	6%	3
Sheep	4%	2
Horses	2%	1

CONFINEMENT AND SHELTER

Although most of the homesteads were fenced (55%), all the dogs were able to roam freely. Shelter was provided for dogs in 43% of households while 18% were allowed indoors on occasion or regularly with one even reported to have its own couch in the house. Only 10% of dogs had access to bedding material such as blankets or sacks.

REASONS FOR OWNING DOGS

The main reason people owned dogs, was for security reasons (86%). 22% used their dogs for hunting and the majority of these also used them for security. Only 12% indicated that they kept dogs for companionship, and of these a few used them for security or hunting as well. Other reasons provided for owning dogs included that they are used to chase monkeys away (1) and to keep livestock away from crops (1). None of the respondents indicated breeding or livestock herding as the reason for having a dog.

FEEDING

All the dogs were fed on leftover food from the family and this consists mainly of "mieliepap" (maize meal porridge) with varying combinations of fat, vegetables, rice and meat sauce added. Most dogs (41%) are fed twice a day when the family also eats, 32% are fed three times a day and the remaining 26% are fed once a day.

TREATMENT FOR ENDO- AND ECTOPARASITES

A large percentage (76%) of households reported that they do treat their dogs for external parasites (fleas and ticks), most of these (51%) using dip (in most cases it appears to be cattle dip). See Table 2 for a breakdown of products and / or methods used to control ectoparasites. Some dog owners reported that they bought ectoparasite products but could not name them. The main source of these products appeared to be the local pharmacy. The frequency at which ectoparasite control was performed, varied from once per month to every 4 months, with the majority of respondents reporting that it was done whenever parasites were seen on the animals, i.e. there was not a structured treatment schedule applied in most cases.

Table 2: Methods and products used for ectoparasite control (n=39)

Method of control	Percentage	n
Dip (either with cattle at the dip tank, or individually with a cattle dip product)	51%	20
Non-specified ectoparasiticides e.g. "medicine from the chemist", "husband buys something"	13%	5
Jeye's fluid	8%	3

Car oil	5%	2
Manually removed	5%	2
Something provided by TAWI	5%	2
Doom (insecticidal spray)	2,5%	1
Omo (washing powder)	2,5%	1
Sunlight liquid (dishwashing liquid)	2,5%	1
Wash in the river	2,5%	1
Anti-cockroach product	2,5%	1

Endoparasite treatment was administered by 41% of the total number of households investigated, but the distribution between the two communities differed markedly with 86% of Mtweni households making use of deworming treatment for their dogs compared to a mere 26% of Mzwakazi residents. There was a similar but less significant difference with regards to ectoparasite treatments with 74% of Mzwakazi families applying tick control of some sort compared to 86% in Mtweni. This comparison must take into account the relatively small number (n=13) of Mtweni respondents. Worm treatments were usually done with a tablet obtained from the chemist, and in one instance Valbazen (a livestock benzimidazole anthelmintic) was used. Some owners reported deworming their dogs every 4 months while others treated their dogs when they perceived a problem, i.e. not according to a set schedule.

HEALTH PROBLEMS OF DOGS

25% (13) of respondents felt that there were no health problems with the dogs. The most commonly reported problem was that of itchy skins and dogs that scratch a lot. This was confirmed by the team's observations – high levels of flea infestation, crusty skin, alopecia (hair loss) and constant scratching and licking by the dogs were seen. Loss of appetite and / or starvation was the second most common health problem identified. These two signs were grouped together as respondents reported a "lack of eating" and it was not entirely clear whether they perceived it as being due to loss of appetite (possibly secondary to disease) or malnutrition. One respondent identified "mange from eating tinned fish" as a perceived health problem. This is interesting as it relates to a similar belief in Mnisi, Mpumalanga, where there is a perception that dogs can get rabies from eating tinned fish (Thys et al, 2013). Table 3 lists all the canine health problems identified by the respondents.

Table 3: Perceived health problems of dogs

	Condition / sign	**n**
1	Itchy skin / mange	8
2	Loss of appetite / starvation / not eating	5
3	Weak puppies that die	3
4	Frothing	3
5	Genital swellings / vaginal discharge / penile swelling	3
6	Aggression / rabies	3
7	Eye problems with puppies	2
8	Coughing	2
9	Weakness	2
10	Bitches get weak and die after giving birth	2
11	Shaking / fitting	1
12	Too many puppies (need sterilisation)	1
13	Vomiting	1
14	Diarrhoea	1
15	Blood in the urine	1

16	Lack of shelter	1
17	Ticks	1
18	Mange from eating tinned fish	1

ACTIONS TAKEN WHEN DOGS GET SICK

The most common (53%) action taken when a dog is sick, was to adopt a "wait and see" attitude, while 27% would treat the animals themselves. Self-treatments were done with products obtained from the pharmacy or cattle medication. Table 4 lists all the responses.

Table 4: Action taken when dogs get sick

Wait and see	27
Treat self	14
Ask TAWI staff member	7
Ask animal health technician or state vet	6
Never faced with the decision before	5
Hang the dog from a tree in the forest (to die)	3
Give nicer food	1
Puppies moved indoors when they get sick	1
Ask farmers for advice	1

This result indicates that there is a lack of knowledge about treating sick dogs. A small amount of basic primary animal health care education would probably have a meaningful impact in these two communities. A matter of interest and possible concern is the practice of hanging dogs from trees in the bush. This seems to be done as a form of euthanasia – one respondent mentioned doing this "when a dog has rabies".

MORTALITY RATES AND CAUSES OF DEATH

Of all the puppies born over the past year (166), three quarters had died (125), indicating a high puppy mortality rate of 75%. Over the past year, 43 adult dogs had died, indicating a 20% mortality rate. Table 5 lists all the perceived causes of death as reported by the dog owners.

Table 5: Perceived causes of death in dogs

Cause of death as reported by respondents (only where a specific answer was given - "sick", "don't know", "disappeared", "given away" etc excluded)	**Dead puppies n=125**		**Dead adults n=43**	
	n	**%~**	**n**	**%~**
Hit by car	2	2%	6	14%
Loss of appetite / starvation / not eating	5	4%	3	7%
Skin problem	2	2%	3	7%
Diarrhoea	1	1%	1	2%
Vomiting	-	-	1	2%
Worms	2	2%	-	-
After rabies vaccination by state vet	3	2,5%	-	-
Cold	4	3%	-	-
Fitting / frothing	1	1%	-	-
Bitch did not allow pups to suckle	1	1%	-	-
Dog fight	-	-	1	2%

Ate poison	-	-	2	5%
Beaten	-	-	2	5%
Rabies	-	-	1	2%

The majority of adult deaths were caused by motor vehicle accidents, while not eating as well as cold ambient temperatures were the main causes of death in puppies. As this study investigated the perceptions of the respondents, the validity of their "diagnoses" was not confirmed e.g. the one case of rabies that was reported, and the perception that some of the deaths could be attributed to the recent state vet visit. Since only puppies were reported to have died following the recent visit of the state vet team, considering the high puppy mortality rate, it is quite likely that these puppies succumbed to other causes of death. However, it may be worth noting the risk of any intervention, especially one that occurs for the first time – people easily make links between such events and other events that occur shortly afterwards. Visiting communities a few times prior to physical interventions such as vaccinations, sample collection etc may be useful in order to build up trust, and post-intervention follow-up may need to include post mortem examinations of dead animals so that perceptions can be corrected or confirmed with factual information. The two responses mentioning dogs that were apparently beaten to death, are concerning but no reasons were given. This may warrant further investigation.

USE OF VETERINARY SERVICES

A majority of dog owners (55%) reported that their dogs had been vaccinated. It is assumed that these dogs were mostly vaccinated in a recent state veterinarian rabies vaccination campaign which took place about 3 months prior to this project, notably the first such project in this area, thus the findings do not necessarily represent an ongoing awareness of vaccinations.

When asked whether there is a need for veterinary services in their area, 100% of respondents answered in the affirmative. Most respondents were vague about exactly what these services should entail and made very broad statements like "you know best what you can offer" or "whatever can help the dogs", indicative of a lack of knowledge regarding veterinary services. Specific requests are categorised in Table 4 and reflect a broad range of primary and higher level animal health care needs, including a need for more information. The requests for sterilisation reflect a high level of responsible pet ownership, but this was not a widespread need. Cognisance should be taken of the need for assistance with livestock. The relatively high level of awareness about rabies is probably linked to the recent state vet campaign.

Table 6: Veterinary services required (n=51)

	Action required	**n**
Preventive / husbandry	Rabies vaccination	4
	Dips	2
	Nutritional advice	1
	Raising healthy pups	2
	Puppy deworming	1
	Training dogs not to destroy property in the yard	1
Treatment / procedures	Treatment for sick animals	3
	Treatment for skin problems	3
	Sterilisation	3
	Euthanasia	1
Resources	Blankets and bedding	2
	Shelter	1
	Food	1
	Information	3
Other species	Help with cattle	2

	Help with chickens	1
	Goat vaccinations	1

"CUTTING THE TONGUE" (SURGICAL REMOVAL OF THE FRENULUM)

Of the 42 respondents who were asked whether they have performed this procedure, 67% (n=28) replied in the affirmative. The procedure is performed either as a preventive measure in young puppies – "it keeps the puppy fit and healthy", or, more commonly, as a treatment when an animal loses its appetite. One respondent stated that it was done to control worms. The term "skelm" (Afrikaans word for "scoundrel") was used by the respondents when referring to the "worm" under the tongue and to worms in general.

RESULTS - BIOLOGICAL SAMPLES

THE DOG POPULATION

Ninety-seven dogs were processed. The majority of the population was female (58%), medium- (59%) or small-sized (41%) with an average body condition score of 2,6/5 which relates in practical terms to a lean but not emaciated body condition, slightly below the accepted norm of 3. The majority of dogs (67%) were identified as Africanis dogs. There was a marked difference between the two areas with Mtweni dogs showing much more breed variety – although no purebred animals were seen, the majority of dogs in Mtweni were terrier crosses with a wide variety of other crosses.

FAECAL SAMPLES

Of the 77 faecal samples that were submitted for flotation tests, 6 (~8%) were negative. Five samples were insufficient for a reliable result, but they all nevertheless yielded some worm ova. Samples yielded from one to 6 different parasites per animal. Apart from 8 worm species, three protozoa and one mite were identified. The findings are tabulated in Table 7. The most ubiquitous internal parasite was *Ancylostoma* sp (hookworm, found in 56% of the dogs sampled, species cannot be identified on faecal flotation alone), followed by *Toxascaris leonina* (a roundworm, in 47% of dogs sampled). Similar parasites were found in the two communities, but the distribution differed markedly with Mtweni having a far higher proportion of dogs with *Sarcosystis* sp and *Ascaris* sp and Mzwakazi showing proprotionately more cases with *Ancylostoma* sp and *Toxascaris leonina*. Figure 1 compares the distribution of species between the two communities.

Hookworms are blood-sucking parasites that live in the dog's intestines and can cause aneamia which could be fatal in puppies. Other signs associated with hookworms are loss of appetite, weight los, dark, tarry faeces, diarrhoea and coughing. Hookworms are transmitted through contact with faeces from dogs that are shedding eggs and can enter the dog through the mouth or through the skin of the footpads, as well as from mother's milk. They are not visible to the naked eye, in contrast to the roundworms which can easily be identified in faeces. Hookworms can ocassionally cause cutaneous larval migrans in humans when larvae migrate into the skin, causing a skin rash, mainly on the feet. It is usually a self-limiting disease in humans. Roundworms cause loss of appetite, weight loss, a distended abdomen (pot-belly), vomiting, diarrhoea and coughing/gagging and can cause severe illness in young puppies. Puppies can be infected in utero through the placenta, and by contact with contaminated faeces. *Toxocara canis* can cause visceral larval migrans in humans but it is rare and often sub-clinical.

The prevalence of *Sarcoscystis* and *Ascaris* is interesting because neither is a parasite of the dog, hence would not cause direct pathology in the dog. The eggs were thus ingested by the dogs and passed out in the faeces whithout any ill effect in the dog. It does however provide us with information about the ingestive behaviour of the dogs. *Sarcoscystis*, being a protozoal parasite that occurs in the muscles of cattle, goats and pigs, would have been ingested by the dogs when eating affected (raw) meat. *Ascaris* occurs in pigs and humans (faecal flotations do not distinguish between the different species) and indicates that dogs ingested porcine or human faeces or flesh. These findings are in accordance with the scavenging nature of dogs. However, this does not explain the differences between the two communities in terms of *Sarcocystis* and *Ascaris* prevalence.

The relative absence of cestodes (tapeworms) is significant. With regards to tapeworms, only one dog was diagnosed with the *Dipylidium caninum* and no *Taenia* were found. The absence of *Echinococcus* is encouraging

as it has potentially serious zoonotic implications. The paucity of cestodes is diffcult to explain. This study did not utilise adhesive tape swabs to collect samples for identification. According to Minnaar et al (2002), adhesive swabs are the most effective method to detect *Taenia* in the live animals, being 90% accurate. While faecal flotations are an acceptable method of identifying cestode ova, it may be advisable to include adhesive tape swabs in future studies. The season may have played a role as lower levels of endoparasite infestations are usually seen during the winter months. It is interesting that there was only one case of *Dipylidium caninum* considering the large numbers of fleas that were encountered, as the two parasites are often seen together due to the flea being a carrier of *Dipylidium* eggs.

The prevalence of *Spirocerca lupi* (the so-called dog throat worm) of 4% is lower than has been previously reported in South Africa, with two studies finding 14,5% and 13% respectively (Minnaar & Krecek, 2001; Minnaar et al, 2002). The low incidence may be due to the standard faecal flotation method for identifying *Spirocerca lupi* not being as sensitive as one utilising magnesium sulphate. This should be taken into account in future for similar studies. *Spirocerca* is relevant because it causes quite severe clinical signs compared to most other helminths, and thus would have a meaningful impact on the welfare of the dogs.

Table 7: Parasites identified in faecal samples

			Mzwakazi	Mtweni	Total	Prevalence
1	*Ancylostoma* sp	Hookworm	38	5	43	56%
2	*Toxocara canis*	Roundworm	6	0	6	8%
3	*Toxascaris leonina*	Roundworm	29	7	36	47%
4	*Trichuris vulpis*	Whipworm	16	6	22	29%
5	*Ascaris sp*	Roundworm	16	7	23	30%
6	Coccidia	Protozoa	1	2	3	4%
7	*Isospora*	Protozoa	8	0	8	10%
8	*Sarcocystis*	Protozoa	6	15	21	27%
9	*Spirocerca lupi*	Throat worm	1	2	3	4%
10	*Capillaria*	Roundworm	1	0	1	1%
11	*Demodex* sp	Skin mite	1	0	1	1%
12	*Dipylidium caninum*	Tapeworm	1	0	1	1%
13	*Negative*		5	1	6	8%

Figure 1: Comparison of endoparasite distribution (percentages) between the Mzwakazi and Mtweni communities.

Key: Red bars represent Mzwakazi, blue bars represent Mtweni

Vertical axis: Number of positive samples; horizontal axis: Species identified (numbers correspond with those in Table 7)

ECTOPARASITE SAMPLES

All 16 flea samples were identified as *Ctenocephalides felis* (the cat flea). This is the most common flea of domestic animals worldwide and occurs on dogs and cats. The main effect on the host is pruritus (itchy skin) and irritation. Some dogs may develop flea allergy dermatitis which results in an even more intense itch. Cat fleas serve as the intermediate host for the dog tapeworm (*Dipylidium* caninum). Adult fleas require a fresh blood meal in order to reproduce, and very heavy flea infestations, especially in young puppies, could contribute to anaemia, particularly when there is also a heavy hookworm infestation.

The most prevalent tick in the 74 samples examined for ticks was the brown ear tick (*Rhipicephalus appendiculatus*) with a 65% prevalence. Refer to Table 8 for the prevalence of all the tick species. The yellow dog tick, *Haemaphysalis elliptica*, is responsible for the transmission of canine babesiosis (tick bite fever).

Table 8: Prevalence of ticks

Tick species	Common name	n	Prevalence
Rhipicephalus appendiculatus	Brown ear tick	48	65%
Amblyomma habreaum	South African bont tick	42	57%
Ixodes sp	Sourveld tick	8	11%
Haemaphysalis elliptica	Yellow dog tick	6	8%
Rhipicephalus simus	Glossy brown tick	2	3%

RECOMMENDATIONS

The following recommendations are based on the data collected and the team's observations during the project. In most cases, it is better to negotiate solutions to problems with the local community, than attempt to autocratically apply known solutions.

FOCUS ON PUPPY HEALTH

The puppy mortality rate is extremely high. It is likely that the combination of a high worm (hookworm and roundworm) and flea infestation, malnutrition and exposure to the cold during winter, are major contributing factors. The following is recommended:

- Deworming efforts should focus on lactating bitches and their puppies, ideally from 2 weeks of age every two weeks until 8 weeks. A relatively cheap oral dewormer like pyrantel pamoate (Nemex®) should be effective. The older dogs probably have a level of immunity and are not in as much need of regular dewormer.
- Dog owners should be encouraged to start feeding puppies at around 4 weeks of age, as this is the time when the amount of milk they get from the mother is no longer sufficient to maintain the puppies. Sloppy mieliepap with as much added fat and protein as possible (especially fat) is recommended.
- The bitches should be fed as much food as possible during lactation (ideally freely available), up to 5 weeks after birth.
- Challenge the dog owners to come up with innovative ways of making dens for bitches with puppies to provide shelter during winter. Recyclable materials such as car tyres could be used. Soil has a thermoregulatory effect, therefore digging into soil and reinforcing such "caves" could be a useful approach.
- Collaborate with the local chemist to recommend and sell cheap but effective dewormers.

FOCUS ON SKIN CONDITIONS

It was noticeable how much time dogs spent scratching and licking themselves due to their itchy skins. Pruritus affects quality of life – dogs that are constantly itching are experiencing poor welfare. The skin problems are most likely caused by a combination of:

- Fleas and flea allergy dermatitis
- Skin mites (*Sarcoptes* and *Demodex*) – this was not tested for during this project but one faecal sample did contain *Demodex* eggs and the clinical presentation of the dogs (the itchy, crusty skins associated with sarcoptic mange (especially on ears and elbows) and the patchy alopecia (hair loss) associated with demodectic mange), suggests both skin mites are prevalent.

Suggestions for dealing with skin conditions:

- Since ivermectin (Ivomec®) is effective against most of the worms as well as both mites, this would be a good choice to use on dogs with itchy skins and hair loss. The correct dose is 1 ml / 50 kg and should be administered subcutaneously every two weeks until the hair starts growing again and the itching has stopped.
- Flea control is in some ways more challenging as an important part of the flea's life cycle occurs in the environment. Ideally a two-pronged approach should be taken: Fleas on the animals themselves as well as flea eggs and larvae in the environment should be treated. There are products available that kill fleas on dogs and also those that "sterilise" fleas rendering their eggs infertile. A combination of a product that kills fleas on the dogs, a "sterilising" product and an environmental product is the best way to deal fleas. These products are generally not cheap and may not be sustaibable in these communities. Normal cattle dip will kill fleas and ticks, but will only be effective if diluted correctly, and if not it can kill the dogs or have no effect at all (apart from contributing to the development of resistance against dip). Actions to consider include:
    - Teach dog owners how to measure the exact correct quantities of dip and volumes of water
    - Encourage owners and children to manually de-flea dogs, especially puppies. The fleas should be put into an airtight container so that they cannot re-contaminate the environment. Consider having a competition for kids to see who can collect the most fleas.
- Ticks do not pose a major threat to canine health in these communities. It may be worse in the summer though when there is likely to be an increased risk of canine babesiosis (tick bite fever).
- Somehow the incorrect perceptions about the effect of Jeye's fluid, Sunlight liquid, Omo etc need to be addressed.

FOCUS ON ONE HEALTH AND HUMANE EDUCATION

The most sustainable impact on long-term dog well-being in these communities is probably through education:

- Responsible animal care – learning about the various parasites and their life cycles, their effect on dogs, other animals and people; nutrition; animal behaviour; general hygiene (this will increase knowledge and skills and could lead to better physical conditions, improved quality of life for animals and people and later even employment opportunities, thus linking to One Health)
- Humane education – promoting empathy for all animals (including livestock), which will ultimately lead to more empathy amongst people (hence the One Health link) – address perceptions relating to animal cruelty e.g. castrations done without anaesthetic, beating of dogs and cutting the tongue. The hanging of dogs appears to be done as a humane gesture, however, it is unclear how the decision to euthanase is reached, and whether the way it is done is indeed humane – this should ideally form part of a future study.
- Resources and assistance are available from:
    - The Humane Education Trust (www.humane-education.org.za)
    - Dr Magdie van Heerden (vanheerdenmagdie@gmail.com)
- Humane education may in the long run be more sustainable and meaningful than medical interventions. Once people have transformed their view of animals and begin to take responsibility for their own animals, they will seek the medical interventions themselves. It is possible to change the quality of life of animals without any formal veterinary assistance but rather focusing on helping people do what they can with their own assets as has been shown with donkey projects undertaken by animal welfare workers in Limpopo Province (Wilson, pers. comm, 2014).

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