Evaluation of Effective Micro-organisms (EM) in Controlling Ticks in Goats (*Capra Hircus*) of the Topnaar Community

Taimi Kapalanga

Abstract

EM was tested in controlling ticks in the goats (*Capra hircus*) of the Topnaar community living along the Kuiseb River in the central Namib Desert. Ticks of the genus *Rhipicephelus* infest this community's goats. Ticks are a major threat to animal production and the Topnaar community has been using old engine oil to attend to the problem. Research to evaluate the effectiveness of EM was undertaken with livestock farmers at Natab 1 settlement east of the Gobabeb Training and Research Centre. The trial had two replications with 30 goats each and was grouped into three different treatments namely; EM, old engine oil and control of 10 goats each. A total of 60 goats were sampled from two herds of 60 and 34 in two different kraals. The research monitored number of ticks by conducting tick counts on individual sampled goats over a period of three months. Apart from tick count, body condition was determined, cost-benefit analysis for EM and old engine oil was conducted and the community was introduced to EM and its uses. The result of the trial shows a significant difference between EM and old engine oil groups. The control group (untreated) shows a high significant different between the two treatments. It was concluded that both EM and old engine oil are better than leaving goats untreated, and that EM is better than old engine oil.

Key words: Effective Micro-organisms (EM), Goats (*Capra hircus*), Ticks and infestation.

1. Introduction

Livestock farming in Namibia has been hampered by many factors, such as widespread disease, parasites, and drought. These types of problems mainly affect rural communities due to an inability to afford quality medication for their livestock and a lack of information and knowledge compared to commercial counterparts.

Small stock such as goats and sheep are the main source of income for rural communities along the Namib's Kuiseb River (Werner, 2003). One of the Topnaars' main problems with their small stock is the prevalence of parasites, especially ticks, in the area. Ticks cause large losses to farmers because they can weaken animals' condition, leading to improper function of the immune system and cause an animal to get sick easily (Maree and Casey, 1993). Ticks are external parasites and depend largely on livestock for their lives including food source and accommodation. Ticks, which are ectoparasites, attach themselves to most agricultural animals (Herren, 1998: 286).

Although low-level tick infestation may not pose a serious physical threat to the host, the animal suffers from the parasitism, which affects its performance and wellbeing until the infestation is detected, usually only once the animal is substantially infested (Maree and Casey, 1993). Ticks cause damage by penetrating the skin and sucking blood from the host animals. Parasite feeding activities from the host can therefore lead to continuous bleeding that creates a zone for other diseases to breed (Herren, 1998).

This has been the case with the Topnaar community members, who have been using old engine oil or used oil to attend to this problem even though this method takes time to remove ticks (Kham, *pers comm.* 2006) and also result from interviews and visual observations. Used engine oil poses a hazard to the environment in which it is applied. This study was a trial to control ticks using Effective Micro-organisms (EM) to assess the effectiveness of EM and to introduce EM use to the Topnaar community.

EM is well known as an environmentally-friendly substance and can help in different areas such that of animals production (Lindros, 2004). Many products were derived from EM, including Effective Microorganisms-5 (EM-5), which was used in the trial. EM-5 is an insect repellent for both animals and plants derived from the fermentation of Multi-Effective Micro-organisms (M-EM), natural grape vinegar, pure liquid cane molasses, alcohol and water. This mixture, when sprayed on the animals

and plants, produces a barrier that is distasteful to insects. It also helps control diseases/ pest attack by the mechanism of competitive exclusion, a form of natural biological control (Lindros, 2004 & 2005).

Apart from treatment and tick count the study also looked at the identification of ticks species, body condition scoring (BCS) of goats, and interviews to obtain information on the costs and benefits of the two methods of treatments (EM-5 and old engine oil) to help determine their economic, social and environmental sustainability.

The research question was to test whether EM-5 would be more effective at controlling ticks than old engine oil and to find a better way for the Topnaar to control ticks in an environmentally friendly way. This could improve the goats' market value and increase production. The hypothesis was that the EM-treated group would have a lower mean number of ticks than the old engine oil and control group.

1.1 Study Area

The trial was conducted at Natab 1 village (a Topnaar community) 7km upriver (to the east) of the Gobabeb Training and Research Centre. There are about 15 residents living in 4 different homesteads at Natab 1. Both Gobabeb and Topnaar community settlements are in the Namib Desert, located along an ephemeral river, the Kuiseb, that separates the gravel plains in the north from the dune fields in the south. The river course is mainly inhabited by acacia trees such as *Faidherbia albida* and *Acacia erioloba* and other trees species, bushes and shrubs which some of them produce products palatable to domestic livestock.

Figure 1 on the next page shows the distribution map for the Topnaar community settlements along the Kuiseb River in which the study area (Natab 1) is indicated with a red arrow and the Gobabeb Centre with a blue arrow.

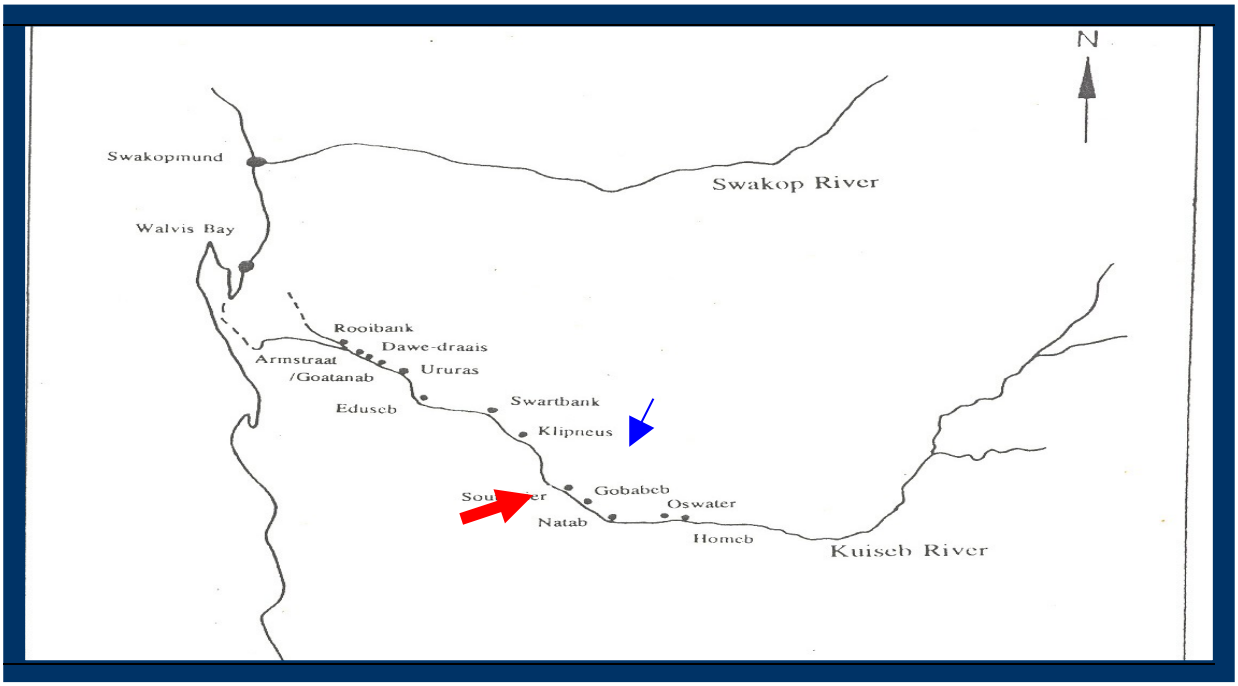

Figure 1: A distribution map of the Topnaar communities (source: adapted from Ward & Van Wyk, 1985).

1.2 Background and literature reviews

1.2.1 Ticks

There are different families and genuses of ticks, the distribution of which depends on the genus species and preferred host. *Otobius megnini* is a tick species that attaches itself in great number to the ears, causing irritation and, in the case of secondary infection, even death (Coetzer, 1996).

Some diseases such as *East coast fever* are severe and so easily spread that even one tick can spread the disease: "In the area where this disease like this occurs it is important to get skilled help because it is very dangerous to allow ticks to infest your animals" (Forse, 1996). According to Coetzer (1994), heavy tick burdens may result in anemia, loss of appetite and weight loss (Directly Noxious Effects) and some tick species cause tick paralysis (Tick Toxicoses).

According to Giovanni (undated), ticks can transmit different diseases in animals and in human. He noted some diseases that can be transmitted by ticks such as Tulaeramia, Borreliosis, Typhus and Crimean - Congo hemorrhagic fever.

According to Brain and Bohrmann (1992) a study investigating tick infestation on baboons in the Namib, only one tick of *Hyalomma sp.* was collected and all other ticks were morphological similar and closely related to *Rhipicephalus Gertrudae. Rhipicephalus Gertrudae* like ticks was found in the part of the Namib Desert (ND) before but the details of the lifecycle and intermediate host were not known for desert environments.

1.2.2 Topnaar community, Livestock, and Ticks

Topnaar communities that have lived in the Namib Naukluft Park (NNP) in Namib Desert for many centuries are pastorarists and hunter- gathers. The sources of security for many Topnaar men and women are a herd of goats or prestigious sheep and cattle; goats are the domestic animals that are present in greater numbers (Seely, et al 1981). A 2003 survey of the Topnaar community reports that "the economy of the Topnaar is based on goats that provide milk and meat, while the sale of the skin in Walvis Bay brings a modest income" (Werner, 2003), a claim supported by studies taken out by other members of GIST 2 (see Chapters 1 and 2), which shows 1089 goats, 117 sheep and 75 cattle present along the Kuiseb.

Ticks are a problem to small and large stocks and affect the production and marketing value for the animals of these communities. The old engine oil is usually smeared around the area affected by ticks on the animal for repellent (Khariseb, *pers com*. 2006). The method seems to be ineffective says community members since it takes very long time to become effective to ticks and recognized with the effects in animals' health such as that of flu in goats, sheep and cattle. In general is called old oil in the fact that it is used and contaminated.

1.2.3 EM Technology and Ticks

EM stands for Effective Micro-organisms. EM is a multi-functional medium that consists of natural and beneficial micro-organisms e.g. photosynthetic bacteria, lactic acid bacteria, yeast, fungi and *Actinomycetes* (Higa, 1982). The micro-organisms form clusters to make a food chain, living in co-existence and co-prosperity. Prof. T. Higa is the discoverer of EM phenomenon.

Some microbes are anaerobic, some are aerobic and others can live in both conditions (facultative anaerobes). Higa describes EM as follows: “EM is not a chemical but a microbial inoculant that functions as a biological control measure in suppressing and/or controlling pests through the introduction of beneficial micro-organisms into the environment.” Pests and pathogens in both livestock and crop farming are suppressed or controlled through natural processes by increasing the competitive and antagonistic activities of the micro-organisms in EM inoculants (Lindros, 2004 & 2005).

EM is "effective" in the sense that the germs in the substance can change and improve the environment in which it is applied. EM is well known to be eco-friendly (Zimmermann, 2005 and Lindros, 2004) therefore many derivatives were made out of it such as EM-5.

Two students from the Department did similar experiment last year with communities in different areas whereby they controlled ticks on cattle (large stock). Ms. Tjilumbu (*pers. Comm*. 2006) used EM-5 to control ticks in cattle and after 4 weeks the number of ticks on cattle that were treated decreased while the one treated with old engine oil still had ticks. According to Mr. Nanyeni (2005), number of tick from all cattle treated with EM eventually declined to zero and cattle looked healthier.

1. 2.4 Body condition scoring of goats

Body scoring is another parameter that basically describes the fatness of an animal. It is a very important aspect since it gives farmers a good indication of body condition for agricultural livestock farming. Since goats have very little body fat compared to other small stock specifically sheep, many body scoring techniques for goats actually reflect muscle cover. To avoid this, body condition scoring for goats can be carried out by feeling along their backs and judging fatness according to set criteria (Steele, 1996). Body scores are taken at regular intervals and can be an effective management tool for enhancing reproductive performance (Mangione, 1987).

According to Mr. William Smith (*pers. comm.* 2006) a farmer near Outjo, most commercial farmers practice body scoring of small stock such as goats or sheep to see how fat their stock is, and “body scoring can also act as a guide to the amount of supplementary feed that can be given to the stock”.

2. OBJECTIVES

2.1 Project objectives

1. To introduce the use of Effective Micro-organisms to the Topnaar community as an environmentally friendly method for controlling ticks.
2. To compare EM-5 to old engine oil as a tick control method in goats.
4. To determine the body condition of the goats.
5. To determine economic, social, and environmental sustainability of the method with regard to application in the Topnaar community.

3. Materials and Methods

3.1 Materials

The following are the major materials, which were used in the experiment:

- Goats - from the Topnaar community members.
- Paint for marking the goats.
- Spraying container.
- Old engine oil.
- Brush for applying the oil.
- EM-5 - prepared at Gobabeb with materials from the Polytechnic of Namibia. See appendix 1 for a full list of materials and method of preparing EM-5.

3.2 Methods

The study was done through meetings, visual observations, an experimental trial, visiting farmers and conducting interviews as well as literature reviews in order to

achieve the research objectives. Here the different methods have been separated according to objective.

3.2.1 Objective 1: To introduce and promote the use of Effective Micro-organisms to the Topnaar community as an environment friendly method for controlling ticks.

Meetings were conducted with Topnaar labourers at Gobabeb, interested staff at Gobabeb, and with community members in two Topnaar settlements, Natab 1 and Soutrivier. This was done to introduce people to EM techniques and to find out from the community member both whether they experience tick problems and what methods they use to control ticks on their goats.

Arrangements were made with Mr. Engelbrecht and Mr. Khariseb, the goats' owners and small stock farmers at Natab 1 settlement. For practical and educational purposes, farmers participated in trial activities such as data collection, treatments and preparation of EM. EM-5 preparation was demonstrated to labourers and community members from Soutrivier and Natab 1 settlements as well as to interested staff and students at Gobabeb Centre (for the preparation method, refer to **appendix 1**).

An information-sharing meeting was held with community members from different settlements at the Topnaar Community Traditional Administrative Office (TCRAO) at Utuseb settlement. A final presentation on the project's findings was given to Gobabeb staff, labourers and other community members.

3.2.2 Objective 2: To compare EM-5 to old engine oil as a tick control method in goats.

3.2.1.1Selection and grouping of goats

30 goats from each kraal (Mr. Engelbrecht's and Mr. Khariseb's) were selected randomly and grouped into 3 equal groups of 10 goats per replication. **Appendix 2** describes step-by-step the selection and grouping processes used. Goats were selected from a group who were almost the same colour, in roughly the same health condition,

and of about the same age (8-18 months) so as to minimize the effect of external factors on the trial.

3.2.2.1 Experimental layout

Kraal 1

Group A	Group B	Group C

Kraal 2

Group A	Group B	Group C

3.2.2.2 Marking of goats

After selection and grouping, goats were marked with paint for easy identification from the rest of the herd and between treatment groups.

With the help of staff, community member and other students, two people worked together for during the marking process. Figure 2 below shows how goats were marked and numbered, while figure 3 shows goats in the kraal after marking process.

Figure 2: Specific goat in a group treatment (control) after numbering and marking *(source: Kapalanga, 2006).*

Figure 3: shows group of goats after the marking process in the kraal *(source: Kapalanga, 2006).*

3.2.2.3 Monitoring of Ticks

Ticks count was conducted on individuals over the whole body wherever ticks appeared. It was conducted every 7th day of the week before treatment and tick numbers were recorded on a data sheet. Numbers of ticks were recorded according to their size: with "small" representing male ticks and "large" representing engorged female ticks. Visual observations were also done on the status of ticks. Pictures of the ears were taken because they are the most attacked parts compared to any other areas (such as hanging sticks on the neck, part behind horns, at the eyes brows or the rest of the body). Pictures of particularly badly-infested areas were taken on a regular basis to judge the progress of treatment. Data was collected over a period of three months between May and August 2006.

3.2.2.4 Treatment & application rate, method and frequency

(i) EM-5

The concentration on the first week was diluted at a rate of 1 part of EM-5 to 9 part of water (10%: 90%). The rate kept on increasing due to the fact that the tick infestations were observed as high. On the second and third week it was increased to a dilution rate of 1 part EM-5 to 4 parts water (20% of EM-5 to 80% of water). On the fourth and fifth weeks, 1 part EM-5 to 1 part water was used. The tick infestation was still high; EM-5 was used undiluted as a last resort from the sixth day until the last week when data collection stopped.

The EM-5 treated groups goats were sprayed with 1 - 10% of diluted EM-5 per goat. Areas that were particularly at risk from ticks were sprayed first, and the remaining amount was sprayed over the rest of the body. About 10 litres of EM-5 was used in the whole trial experiment.

(ii) Old Engine Oil

Old engine oil treated goats were smeared with oil over the affected areas following the same method of application that farmers normally use. It was a bit difficult to measure the exact amount per goat since the brush is normally soaked in the container of oil and wiped over the affected areas. Two-and-a-half 500g Milo containers filled with oil were used over the three months of the study.

(iii) Control group

In the control groups goats were not treated with anything.

3.2.2.5 Identification of tick species

Samples of ticks were collected on the 23rd June and identified at the Central Veterinary laboratory in Windhoek.

3.2.3 Objective 3: To determine body condition scoring of the goats.

3.2.3.1 Body Condition Scoring (BCS)

Three processes of conducting body condition scoring were identified and used as described by Steele (1996). The finger and thumb were used at three points on the goats' back whilst the animal is held in a standing position. See **appendix 3** for the description of body condition scoring process used. BCS data was used to see whether there is a correlation between numbers of ticks on individual goat and score. A Spearman rank-order correlation test was performed and results were presented in graph form.

3.2.4 Objective 4: To determine economic, social, and environmental sustainability of the method with regard to application in the Topnaar community.

3.2.4.1 Interviews and observations

I contacted experts, conducted interviews and observed goats in communities to gather information to help determine the economic, social and environmental sustainability of the EM as a tick control method as opposed to old engine oil.

Several villages were visited and goats were selected randomly for visual observation of ticks attack. Firstly, questions on ticks were incorporated on socio-economic detained interview for socio-economic survey that was conducted in the Topnaar communities at a same time as my project (see chapter 1 & 2, this volume). Other interviews were conducted with goat owners in different settlements around Gobabeb: Natab 2, Soutrivier, Homeb, and Oswater (see Figure 1, the distribution map of the Topnaar community settlements along the Kuiseb). See **appendix 4** for interview questionnaire.

3.2.5 Statistical Analysis

Data such as number of ticks counted on individual goat per day; body condition scores and responses from interview were entered into the computer. Computer programs such as SPSS and MS Excel were used for statistical analysis.

4. Results and Discussions

4.1 Objective 1: To introduce the use of Effective Microorganisms to the Topnaar community as an effective and environment friendly method for controlling ticks.

About four meetings were conducted with the community members at different time during the experiment. During meetings community members and all staff in attendance showed interest in knowing EM in practice and were willing to learn new approaches. In the middle of the experiment the capacity building on EM-5 preparation was planned and done to show people the different materials and procedures used. The materials were shown and all procedures were explained before the preparation process started, while one community member was asked to participate under instructions. See Figure 6. 5 litres of EM-5 was prepared.

Figure 4: Mr. Khariseb busy stirring to dissolve molasses in water during the preparation process of EM-5.

The PH for the prepared EM-5 was monitored every 2 days after the first week of maturation process. After 2 and half weeks, the PH was found at 3.63. This was the right PH and it is a proof that the EM maturity and ready for use. The normal maturity for EM was said to be 3-4 weeks at the PH of 3.6 – 3.7. This EM may have matured fast because of high temperatures in the desert compared to other areas of Namibia such as Windhoek.

4.2 Objective 2: To compare EM-5 to old engine oil as a tick control method in goats.

One-way ANOVA (Analysis of variance) was carried out to determine whether there was any difference between group treatments. The null hypothesis for the ANOVA was that all three groups of treatment would have same mean number of ticks.

4.2.1 Result of ANOVA test

Mean comparisons of number of ticks were done for the second, sixth and the 12th week (last week) of data collection. This was done to see if there is a difference between treatments over time in mean number of ticks. With these results we can draw conclusions of which treatment did better than the other.

Table 1: Results of one-way ANOVA

ANOVA

KRAALNR			Sum of Squares	df	Mean Square	F	P-value
kraal 1	WEEK1	Between Groups	418.400	2	209.200	.519	.601
		Within Groups	10887.100	27	403.226		
		Total	11305.500	29			
	WEEK6	Between Groups	3746.400	2	1873.200	7.596	.002
		Within Groups	6658.300	27	246.604		
		Total	10404.700	29			
	WEEK12	Between Groups	3251.400	2	1625.700	12.119	.000
		Within Groups	3621.800	27	134.141		
		Total	6873.200	29			
kraal 2	WEEK1	Between Groups	3764.600	2	1882.300	1.326	.282
		Within Groups	38328.200	27	1419.563		
		Total	42092.800	29			
	WEEK6	Between Groups	718.467	2	359.233	1.822	.181
		Within Groups	5322.500	27	197.130		
		Total	6040.967	29			
	WEEK12	Between Groups	4120.467	2	2060.233	9.985	.001
		Within Groups	5570.900	27	206.330		

		Total	9691.367	29			

Kraal 1 results

The P-value of .601 on the first week of the trial indicates that there was no significant difference in the mean number of ticks between the three groups of treatment, the P-value of .002 on the sixth week and the P-value of .001 on the last week indicates that there are at least two groups that have means that are highly significantly different.

Kraal 2 results

The P-value of .282 on first week and the P-value of .181 on the sixth week indicates that there is no significant difference in the mean number of ticks between groups. The P-value of .001 n the last week indicates that there are at least two groups that have means that are highly significantly different.

For both kraals, to tell which of the three possible pairs in Kraal 1 (EM-5 and OEO; EM-5 and Control; OEO and Control) were significantly different from each other, I carried out an LSD post hoc test (see Table 2).

Table 2 Result of an LSD Post Hoc test

				Mean Difference (I-J)	**P-value**	**95% Confidence Interval**	
KRAAL NR	Dependent Variable	(I) TREATMEN	(J) TREATMEN			Lower Bound	Upper Bound
kraal 1	WEEK1	em5	oeo	1.60	.860	-16.83	20.03
			control	8.60	.347	-9.83	27.03
		oeo	em5	-1.60	.860	-20.03	16.83
			control	7.00	.442	-11.43	25.43
		control	em5	-8.60	.347	-27.03	9.83

			oeo	-7.00	.442	-25.43	11.43
	WEEK6	em5	oeo	-.60	.933	-15.01	13.81
			control	-24.00*	.002	-38.41	-9.59
		oeo	em5	.60	.933	-13.81	15.01
			control	-23.40*	.003	-37.81	-8.99
		control	em5	24.00*	.002	9.59	38.41
			oeo	23.40*	.003	8.99	37.81
	WEEK12	em5	oeo	-12.90*	.019	-23.53	-2.27
			control	-25.50*	.000	-36.13	-14.87
		oeo	em5	12.90*	.019	2.27	23.53
			control	-12.60*	.022	-23.23	-1.97
		control	em5	25.50*	.000	14.87	36.13
			oeo	12.60*	.022	1.97	23.23
kraal 2	WEEK1	em5	oeo	2.00	.906	-32.57	36.57
			control	-22.70	.189	-57.27	11.87
		oeo	em5	-2.00	.906	-36.57	32.57
			control	-24.70	.154	-59.27	9.87
		control	em5	22.70	.189	-11.87	57.27
			oeo	24.70	.154	-9.87	59.27
	WEEK6	em5	oeo	-1.90	.765	-14.78	10.98
			control	-11.20	.086	-24.08	1.68
		oeo	em5	1.90	.765	-10.98	14.78
			control	-9.30	.150	-22.18	3.58
		control	em5	11.20	.086	-1.68	24.08
			oeo	9.30	.150	-3.58	22.18
	WEEK12	em5	oeo	-7.70	.241	-20.88	5.48
			control	-27.80*	.000	-40.98	-14.62
		oeo	em5	7.70	.241	-5.48	20.88
			control	-20.10*	.004	-33.28	-6.92
		control	em5	27.80*	.000	14.62	40.98
			oeo	20.10*	.004	6.92	33.28

* The mean difference is significant at the .05 level.

The table gives the multiple comparisons for each factor level. The difference in mean and the 95% confidences intervals for the difference are also given.

The groups that have significantly different means are marked with an asterisk. For kraal 1 on the sixth week and last week, there were significantly fewer ticks in the EM-5 group than in the OEO and Control groups, as well as significantly fewer ticks in the OEO group than the Control group. In kraal 2 on the same weeks there was only a difference between the OEO and Control groups. Kraal 2 only saw a significant difference between EM-5 and the control group in week 12. So the null hypothesis is rejected and I can consider the alternative hypothesis that all three groups have different means.

4.2.2 Comparing monthly means number of ticks

The mean tick count for month was calculated in MS Excel and presented in charts, allowing us to see how tick infestation progressed/changed over the three months of the study for each treatment regime. Below is the summary of mean number of ticks per treatment on monthly basis.

Table 3. Summary of the monthly means number of ticks of each kraal (replication) per treatments.

	Kraal 1 (rep.1)			Kraal 2 (rep.2)		
	EM-5	**OEO**	**Control**	**EM-5**	**OEO**	**Control**
May	51.7	45.8	37.1	13.6	11.3	26.2
June	42.7	35.4	35.4	13.9	14.1	23.5
July	31.0	31.3	42.3	10.7	11.6	25.1
Aug	14.6	27.5	40.1	6.6	14.3	34.4

Figure 5 and 6 below presents the monthly mean in form of graphs together with 95% confidence intervals.

a) Kraal 1 (Replication 1)

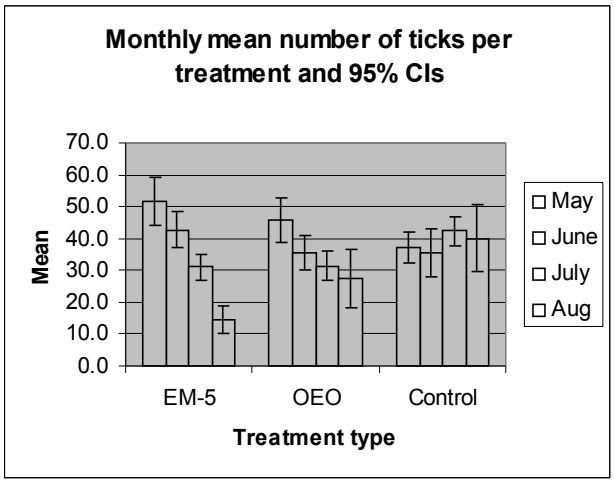

Figure 5: Monthly mean number of ticks through out the experiment.

b) Kraal 2 (Replication 2)

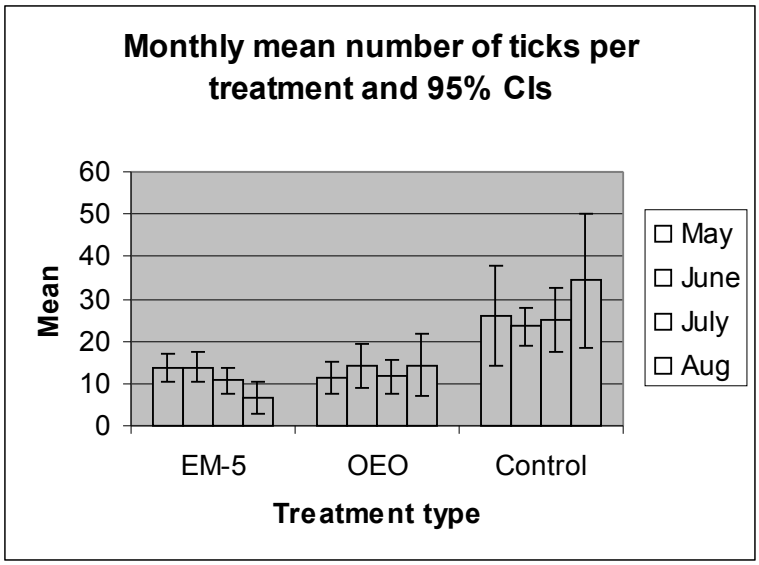

Figure 6: Monthly mean number of ticks through out the experiment.

Even though EM-5 treatment in kraal 1 had a high mean of 51.7 in the first month (May) compare to old engine oil with 45.8 and control with 37, there was a clear decreases in mean through out the experiment. The end mean was very low compared to the mean for the oil and control groups. The oil group kept on decreasing but very slowly while for the control group the mean number of ticks kept on increasing.

A comparison was also done between treatments on specific week (second and sixth week of data collection) in different months during the experiment. Figure 6 and 7 below shows the difference in mean between treatments for both kraals.

a) Kraal 1 (Replication 1).

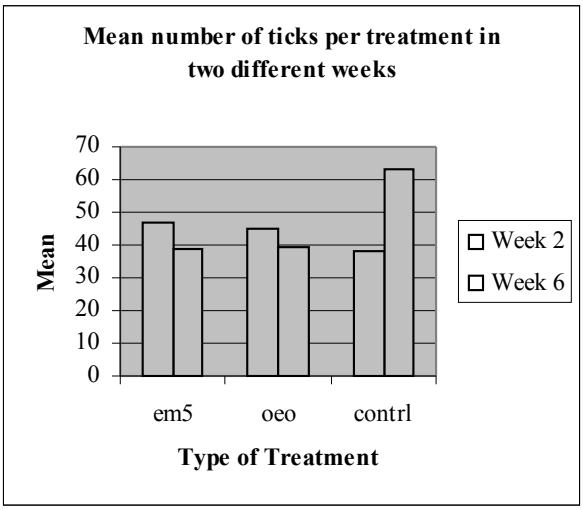

Figure 6: Mean number of ticks on two different weeks earlier and later during the experiment.

B) Kraal 2 (Replication 2)

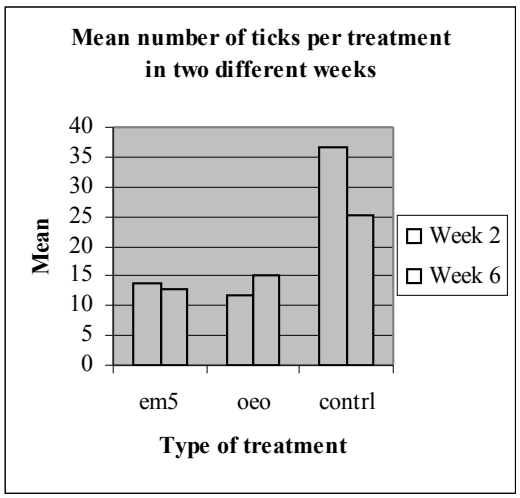

Figure 7: Mean Number Of Ticks On Two Different Weeks As Before And Later During The Experiment.

The above result shows that there was a difference in the mean number of ticks counted from each treatment between the second and the sixth week in both kraals. There was no significant difference in mean number of ticks in kraal 1 and significant difference shown in kraal 2. Results are mixed. In both Kraals, EM5 did better than OEO and both were better than Control. If you look at the mean between the two weeks, in kraal 1; EM and oil means decrease slightly. In kraal 2; EM group means decrease, oil group means increase while control decreases fast. This shows a significant difference between treatments.

4.2. 3 Visual observation on ticks in experimental goats

Records were kept on five goats per treatment in each kraal, whereby pictures were taken so that I will be used to compare the difference looking on the status of ticks. Figure 8 shows the ear of goat number 23, an EM-treated goat in Kraal 1. The picture was taken at the beginning of the experiment (05 May 2006).

Figure 8: The status of goat number 23 which was heavily attacked by ticks on the ear (source: Kapalanga, 2006)

More ticks were found and counted on the ears. Some ticks were also counted on parts of the goat such as on the hanging sticks on the neck, the part behind the horns, at the eyebrows, as well as elsewhere on the body. Regular inspections were done and there were no ticks found between either the hooves or at the part of the tails. Figure 9 below shows the status of goat number 23 on the ninth week of treatment.

Figure 9: The status of goats number 23 on the ninth week (14 July 2006)

The picture shows an improvement from week one to week nine. During the experiment it was observed that sometimes the number of ticks increased/decreased unexpectedly, regardless of treatment to treatment.

During counting you can see with the naked eye that some ticks are no longer active like the others and might fall out any time. On EM-5 treated goats in both kraals, some goats had a number of ticks which decline to zero from the sixth to eighth week. Even though This may be an indication of the distasteful environment produced by the treatments that ticks can no longer tolerant or that they have finished their life cycle.

A tick count was not an easy process since it needs good attention and commitment to work. Looking at the data, was fluctuation in number of ticks counted on individual goats throughout the research. Overcrowding may be a main cause in kraal 1, since this kraal held about 32 goats which were not included in the experiment. When the kraal is overcrowded like this, it is difficult to control ticks on treated goats because ticks will be just picked up from untreated goats. Other factors such as change in weather and ticks species are also important.

4.2.4 Tick identification results

Proper identification of the tick is of utmost importance when dealing with organisms associated with ticks so that one can timely the treatment. The species was identified by me with full support from Dr. Sheehama, as a brown hard tick which represents the genera of Ixodidae and genus Rhipicephalus species.

Ticks of this genus are distributed throughout Namibia and several species occur. They attack hosts on the ears, eyes, legs, and neck. Some species of this genus

attack both domestic and wild animals. Some species transmit pathogens like *Theileria parva lawrenci* (corridor disease), *karoo paralysis (toxicosis), spirochaetosis, and spring lamb paralysis* in sheep and goats (Coetzer, 1994 and Kaufmann, 1996).

4.3 Objective 3: To determine body condition scoring of the goats.

Table 4: Correlation between body condition scoring and number of ticks.

Correlation

			SCORE	TICKS
Spearman's rho	SCORE	Correlation Coefficient	1.000	-.281
		P	.	.133
		N	30	30
	TICKS	Correlation Coefficient	-.281	1.000
		P	.133	.
		N	30	30

The result shows that there was no correlation between score and number of ticks. The important section for this result is the correlation of score and number of ticks. The statistic is given first (r = - 0.281), then the P-value (labeled 'Sig. (2-tailed)' and 0. 133) and finally the number of pairs of observations. As r is negative it shows that there is negative assortment of individuals in pairs in the results above.

4.4 Objective 4: To determine economic, social, and environmental sustainability of the method with regard to application in the Topnaar community.

4.4.1 Interviews and Observations

The totals of 25 Topnaar community members who are farming with livestock were interviewed in 10 Settlements. According to the information obtained from the farmers; 24 farmers experienced a tick's problem with his livestock. 21 farmers acted to

prevent tick problems while only 3 farmers said that they never do anything about tick problems. See Figures 10 and 11 below.

Farmer experiencing ticks problems do not just let their goats suffer but have tried different treatment as precaution measures against the blood sucking and irritating parasites on their livestock.

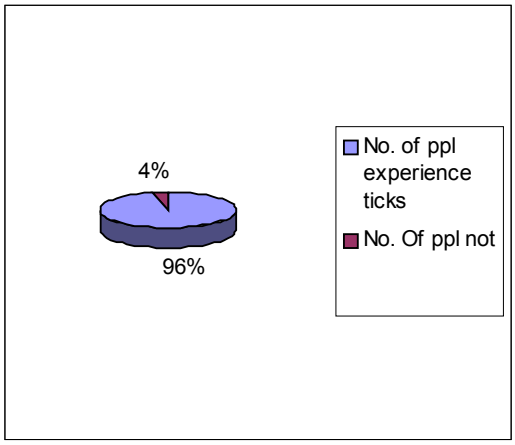

Figure 10: Number of farmer who experience tick infestation (N = 25)

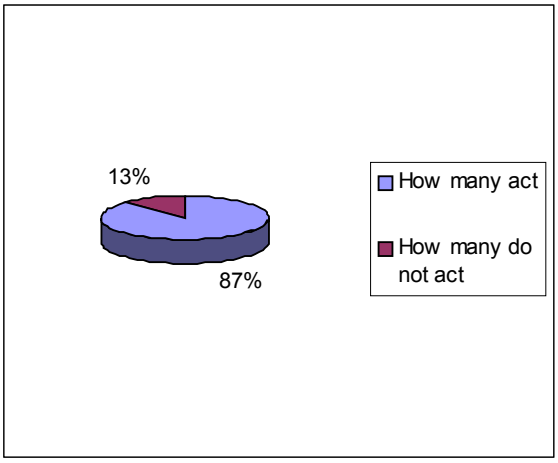

Figure 11: Number of farmer who act against tick problems (N = 24)

Many farmers mentioned that they noticed damage by ticks to their animals' skin and with such a damaged animal you would not make as much profit. They said that tick damage has effects on the market value of animals: for example, when there is high tick infestation the price fluctuates between N$ 250.00 – N$ 380.00 compared to N$ 350.00 – N$ 600.00 when goats are free of ticks or have very few ticks. The price usually depends on the size and age of the goats.

They said that ticks are mainly attack goats' ears and the part behind their horns and that some can be found at eyebrows as well as out- and inside the nose. Kids were also examined for ticks. Most kids were found with ticks attach on the edge of the nose.

Figure 12 below was taken during the interview, when goats for Mr. Vries (a farmer at Homeb) were sampled and checked for ticks. I had a good discussion with Mr. Wellem and **appendix 5** gives a brief summary of Mr. Vries's background on livestock farming and experience of tick devastation on livestock.

Figure 12: Show the ear of a goat with an excessively heavy infestation of ticks *(source: Kapalanga, 2006).*

Farmers claim that "ticks have no specific season when they break out but they are more toward winter". Mr. Engelbrecht mentioned two indicators that he usually watches out every year and starts prepare for ticks outbreak on his goats; more Faidherbia albida pods along the river and more grasses in the field.

The interview find out that Topnaar community members who are farming with livestock are using different methods to respond to ticks problem. They are as follows:

a) Old Engine Oil

b) Old oil mixed with dip

c) Deadline

d) Injection

e) Grease

f) Remove ticks by pulling them out and burning them

g) Feeding goats with bitter plants since ticks do not like bitter blood

From the summarized data of respondent to different method of controlling ticks, 42% out of 21 respondents use old engine oil. Figure 9 below presents the percentages of farmers using different control measures.

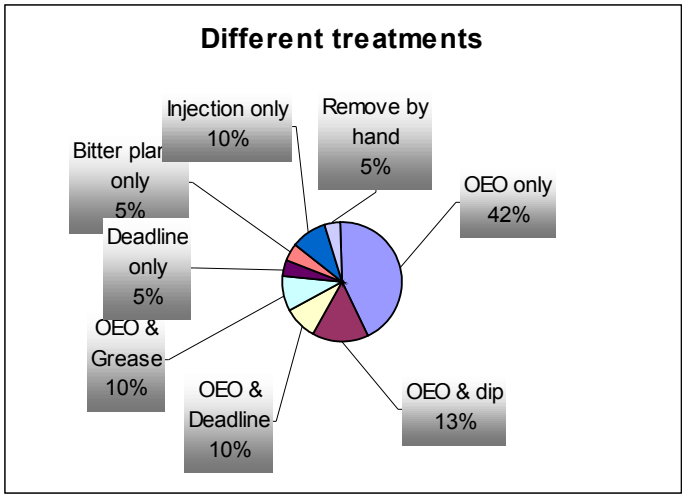

Figure 13: Pie chart showing number of farmers in percentage using different treatments against ticks.

This shows that old engine oil was the most-used control measure practiced by many farmers and that only a few use other measures. All other treatment except bitter plants and removing of ticks by hand are harmful to both animals and the environment.

4.4.2 Cost-benefit analysis

In order to judge whether EM-5 is an appropriate tick control option for the Topnaar, I considered and compared (quantitatively when possible) all costs and benefits of EM-5 as opposed to the alternative treatment regime of old engine oil.

a) Effective Micro-organism

There are costs involved to purchase EM material and it also requires favorable conditions for the micro-organisms to function properly. The molasses costs N$5 per litre and Stock EM is N$115 per litre. This stock can be used to produce over 70 litres of Multi-EM and with 1 litre of molasses you can produce 7 litres of EM-5. since there is only one supplier of EM materials who is in Gobabis, the delivery costs is about N$ 50 for 1L of stock EM and 5 litres of molasses. This is not a fixed cost but depends on the distance since it is to be transported from Gobabis to the nearest town to the customer. Other costs involved in the production of EM-5 are; Alcohol, natural fermented vinegar cost about N$62, labour and container to keep the mixture during the fermentation process.

For example; I ended up using undiluted solution of EM-5 at a rate of 100ml per goat over ten weeks and I treated 20 goats, you will need 10 litres of EM-5. This will cost you about N$ 120 for the materials needed to prepare EM-5.

Even though the material seems to be expensive, EM prevents putrefactive environmental conditions, which encourage diseases, odors, and attraction of pests if used in the environmental surroundings in a livestock operation. It is also clear that if you have a healthy environment, you will decrease sickness to both human and livestock.

The labor cost of this treatment is quite low. The preparation of EM-5 takes about 10 –15 minutes, if you know the steps involved and 15 –25 minutes for an inexperienced person. It is usually easy and a quick method to adopt and requires only one person. Any container can be used provided that it is clean and airtight when sealed. EM-5 takes 3-4 weeks to mature depends on the condition of the area and has a life span of 3 months: it can be prepared in bulk to save time and effort and then used over a long span.

If community members decided to prepare EM-5 and if did not have access to a 40% alcohol, some native plant matter, or juice could perhaps be used instead: there must be something the goats eat, or in their environment which would be unpleasant for the ticks. Some users of EM recommend one option that can be used to replace the alcohol as to ferment some used cooking oil with EM--200ml used, filtered cooking oil; 10ml EM; 10ml molasses; 20ml water--mix and let ferment 5 days or so--until it smells sweet and sour and use that.

In my views the benefits EM could also bring to the rural sector justify its close scrutiny. In addition, many planning and environmental benefits will accrue. Not only controlling ticks but also it can suppress some other diseases on animals and control odor on the waste management system.

b) Old engine oil

This treatment method is much cheaper than EM-5. Most of the community mentioned that they get the old engine oil free of charge from family members and

friends who have cars. Three farmers said they used to buy and use engine oil from the shop since they have no source where they can get it free.

Even though oil is cheap to get, it has effects on the environment such as that of pollution if it ends up in water and also to animal itself on which it will be applied.

5. CONCLUSION

To compare the treatment; EM and Oil and control, it appears from the results that EM does better than the oil. This result is not conclusive, however: more time for data collection is needed in this type of studies to have more data to compare and come up with a concrete conclusion to recommend to the community. EM did not work as well as was expected and more studies would help determine why this is the case. It may be because of the long interval between treatment days and overcrowding.

With the new method of controlling ticks you can promote a healthy environment and improve the health of the livestock to which it is applied. Currently 42% percent of the Topnaar communities are using old engine oil that is adding hazard to the environment and also to animals and people health can be replaced.

From the body condition scoring I conclude that body scores do not have anything to do with tick infestation; it seems from my results that high numbers of ticks do not affect goats' condition such that they lose a great deal of fat.

The community showed interest during interaction with students, making it easy to work well with them. Looking at their experience and the effort they take to respond to the tick problem, there are some who develops effective strategies such applying treatments in advance instead of waiting for the outbreak; so that when ticks do appear they fall off immediately.

Meetings were successful due to good interaction with community members. I noticed that it is not easy to work with the community but that communities co-operate when you act in a good manner toward them. They are willing to learn and to adopt the developments being tested even though they may take time to put it into practice.

6. Recommendation

I would like to recommend that the community members who were involved in the experiment continue using EM since it is a safe method to be applied in the

environment. Even though it does not give entirely satisfactory results at first I think they can keep on applying it and see if it will do well.

Extension could make contact with expertise in the field of EM application to introduce the entire community to EM technology through practical trainings—this was just a trial experiment and did not reach the entire Topnaar community.

I also recommend that in future studies similar to this one trial goats be separated from the rest, length of treatment application can be adjusted back to 2 days per week and if possible to mark ticks during counting so that you will see the new ones. This would be a lot of work but it would allow better conclusions on the difference in increase or decrease.

I would also recommend another options as way of controlling ticks which is also an environmental and economical viable, the use of salt in water. Since EM-5 is some how expensive and most community member may be not affording to purchase it, salt water can be used to wash the animal's body to prevent tick attaches to the animals during grazing. This was tested by farmers in the Oshikoto and Omusati Region and it works very well.

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APPENDIX 1

Materials needed to make EM-5

- 20 liters Container for mixing – station plastic container
- 60% Good clean water (free of chlorine) preferred one: borehole, rain water, otherwise tap water should be left in the open bowl for a day to lose chlorine – borehole water was used from the station borehole.
- 10% pure liquid cane molasses
- 10% Natural grape vinegar (not spirit vinegar, which is derived from coal) – was purchased from Pick & pay by GIST.
- 10% Alcohol (above 40% alcohol content)
- 10% Good quality Multi-Effective Microorganisms (M-EM)
- 10 litres Container – self collection
- 10 litres Container

Preparation of EM-5

- Mix the pure liquid cane molasses in warm water to dissolve completely.
- Add alcohol and natural grape vinegar (natural vinegar is better than artificial acids example; Spirit Vinegar *Cane or any Ethanol may be used) to molasses water and stir
- Add M-EM last to prevent from dehydrating due to the alcohol and mix well
- Pour the mixed solution into a plastic container
- Seal the container airtight and release the gas often by means of air-trap
- EM-5 takes a little longer to mature about 2-4 weeks at pH of 3.6
- When the EM is ready the strong molasses smell has disappeared.
- The EM-5 should have a sweet smell (Ester/alcohol).

The storage of EM-5

- EM-5 should be stored in a dark cool place, which has a uniform temperature and it should not be stored in the refrigerator or in direct sunlight.
- EM-5 should be used within three months after preparation.

Using EM-5

The EM-5 will be diluted in water 1:20-1:10 before used. It then filled in the spraying container and sprayed to every part of the animal at a rate of 1-10% of the amount of diluted EM-5 to prevent ticks infestation.

EM-5 prepared for experiment

Table 1: The amount of each material used to prepare 5 litres EM-5

1.Borehole Water (chlorine free)	3 L
2. Molasses	500 ml
3. Natural fermented Vinegar (white)	500 ml
4. Gordon Dry Gin (43%)	500 ml
5. Multiplied EM (M-EM)	500 ml

EM is a living entity that needs suitable conditions for life. The prepared EM-5 was stored in the laboratory storeroom (cool dark place) and with no direct sunlight. The time required for preparation and length for maturation of EM was noted. The time required for application of EM-5 and oil was noted during the study.

APPENDIX 2 [probably can be safely cut]

Step by step of selection and grouping

- Give each animal a unique number from 1-30 in each kraal.
- Write the numbers of the animals in the folk on separate pieces of paper (one for each animal) and
- **SEPARATE FEMALE AND MALE GOATS NUMBER**

- Put them in separate containers or carry bags.
- Mix the paper very thoroughly.
- Pick out a piece of paper from the container
- Repeat step 5 and 6 until you have the number of animals you require for each group of treatment.
- Make sure you write down the number for each goat under a collect group treatment you are dealing with after the process and place it aside
- To make sure that each group has equal number of goats of different gender, male and female goats was counted first, piece of paper with their number was then put in separate containers before step three of the process.

APPENDIX 3

BODY SCORING OF GOATS **DATE: 14 July 2006**

KRAAL 1 (replication 1)

1. SPINOUS PROCESS

	Please answer the questions by feel the **spinous processes** in the centre of the goat's back behind its last RIB and in front of its HIP BONE. Indicate by write **Y/N (YES / No)**				
Nr of goats ↓	Are the tips **sharp** **Or** **Less sharp**?	Are the tips rounded?	Is the ridge of the spine above the level of the muscles?	Is the spine at the bottom of the little hollow?	
1	Less Sharp	Y	N	N	
2	Less Sharp	Y	Y	N	
3	Sharp	N	Y	Y	

4	Less Sharp	Y	N	N	
5	Sharp	N	Y	Y	
6	Sharp	N	Y	Y	
7	Sharp	N	Y	Y	
8	Sharp	N	Y	Y	
9	Sharp	N	Y	Y	
10	Less Sharp	Y	N	N	
11	Sharp	N	Y	Y	
12	Less Sharp	Y	N	N	
13	Less Sharp	Y	N	N	
14	Less Sharp	Y	N	N	
15	Sharp	N	Y	Y	
16	Sharp	N	Y	Y	
17	Sharp	N	Y	Y	
18	Less Sharp	Y	N	N	
19	Sharp	N	N	Y	
20	Less Sharp	Y	Y	N	
21	Less Sharp	Y	Y	N	
22	Sharp	N	Y	Y	
23	Sharp	N	Y	Y	
24	Less Sharp	Y	N	N	
25	Sharp	N	Y	Y	
26	Less Sharp	Y	N	N	
27	Less Sharp	Y	N	N	
28	Less Sharp	Y	N	N	
29	Sharp	N	Y	Y	
30	Less Sharp	Y	N	N	

2. TRANSVERSE PROCESS

	Please answer the questions below by feel the tips of the **Transverse process.** Where options given **choose one** and **where no options,** indicate by write **Y/N (YES / NO)**

Goat Nr: ↓	Is it **sharp?**	Is it smooth **rounded?**	How far will the tips of your fingers go under the transverse process? **Easy, little pressure or firmpressure required?**	
1	N	Y	Little Pressure	
2	N	Y	Little Pressure	
3	N	Y	Easly	
4	N	Y	Little Pressure	
5	Y	N	Easly	
6	Y	N	Easly	
7	Y	N	Easly	
8	Y	N	Easly	
9	Y	N	Easly	
10	N	Y	Little Pressure	
11	Y	N	Easly	
12	N	Y	Little Pressure	
13	N	Y	Little Pressure	
14	N	Y	Little Pressure	
15	Y	N	Easly	
16	Y	N	Easly	
17	Y	N	Easly	
18	N	Y	Firm Pressure	
19	Y	N	Easly	
20	N	Y	Little Pressure	
21	N	Y	Little Pressure	
22	Y	N	Easly	
23	Y	N	Easly	
24	N	Y	Little Pressure	
25	Y	N	Easly	
26	N	Y	Little Pressure	
27	N	Y	Little Pressure	
28	N	Y	Little Pressure	

29	Y	N	Easly	
30	N	Y	Little Pressure	

3. LOIN MUSCLES

	Please answer the questions feel the muscle on either side of the BACKBONE between the spinous and transverse process Where options given **choose one** and **where no options,** indicate by write **Y/N (YES / NO)**			
Nr of goats ↓	Are the loin muscles shallow?	Are the loin muscles Moderate?	Are the loin muscles full? / Full developed?	Initial score
1		Y		2
2		Y		2
3	Y			1
4		Y		2
5	Y			1
6	Y			1
7	Y			1
8	Y			1
9	Y			1
10		Y		2
11	Y			1
12		Y		2
13		Y		2
14		Y		2
15	Y			1 (Pregnant)
16	Y			1 (Pregnant)
17	Y			1
18			Full	3
19	Y			0.5 –1
20		Y		2
21		Y		2
22	Y			1 (Pregnant)

23	Y			1
24		Y		2
25	Y			1
26		Y		2
27		Y		2
28		Y		2
29	Y			1
30		Y		2

Conducted by: Amon, Reinhold, Yaara & Tiago

DATE: 14 July 2006

KRAAL 2 (replication 2)

1. SPINOUS PROCESS

	Please answer the questions by feel the spinous processes in the centre of the goat's back behind its last RIB and in front of its HIP BONE. Indicate by write **Y/N (YES / NO)**				
Nr of goats ↓	Are the tips **sharp Or Less sharp?**	Are the tips **smooth & rounded?**	Is the ridge of the spine above the level of the muscles?	Is the spine at the bottom of the little hollow?	
1	Sharp	N	Y	Y	
2	Sharp	N	Y	Y	
3	Less Sharp	Y	N	N	
4	Sharp	N	Y	N	
5	Less sharp	Y	N	N	
6	Sharp	N	Y	N	

7	Less sharp	Y	N	N	
8	Sharp	N	Y	Y	
9	Sharp	N	Y	Y	
10	Less sharp	N	Y	Y	
11	Less Sharp	Y	N	Y	
12	Sharp	N	Y	Y	
13	Less sharp	Y	Y	N	
14	Less Sharp	Y	N	N	
15	Less sharp	Y	N	N	
16	Less Sharp	Y	N	N	
17	Less sharp	Y	N	N	
18	Sharp	N	Y	Y	
19	Less sharp	Y	N	N	
20	Sharp	N	Y	Y	
21	Less sharp	Y	N	N	
22	Sharp	N	Y	Y	
23	Less Sharp	Y	Y	N	
24	Sharp	N	Y	Y	
25	Less Sharp	Y	Y	N	
26	Less Sharp	Y	N	N	
27	Less Sharp	Y	N	N	
28	Less Sharp	Y	N	N	
29	Less Sharp	Y	N	N	
30	Less Sharp	Y	N	Y	

2. TRANSVERSE PROCESS

	Please answer the questions below by feel the tips of the Transverse process. Where options given choose one and where no options, indicate Y/N (YES / NO)			
	Is it sharp?	Is it smooth rounded?	How far will the tips of your fingers go under the transverse process?	

Goat Nr: ↓			Easly, little pressure or firm pressure required?	
1	Y	N	Easily	
2	Y	N	Easily	
3	N	Y	Little pressure	
4	Y	N	Easily	
5	N	Y	Firm Pressure	
6	N	Y	Little pressure	
7	N	Y	Little pressure	
8	Y	N	Easily	
9	Y	N	Easily	
10	Y	N	Easily	
11	Y	N	Easily	
12	Y	N	Easily	
13	N	Y	Little pressure	
14	N	Y	Little pressure	
15	N	Y	Firm Pressure	
16	N	Y	Firm Pressure	
17	N	Y	Little pressure	
18	N	Y	Little pressure	
19	N	Y	Little pressure	
20	Y	N	Easily	
21	N	Y	Little pressure	
22	Y	N	Easily	
23	N	Y	Firm Pressure	
24	Y	N	Easily	
25	N	Y	Firm Pressure	

26	N	Y	Firm Pressure	
27	N	Y	Firm Pressure	
28	N	Y	Firm Pressure	
29	N	Y	Little pressure	
30	N	Y	Firm Pressure	

3. LOIN MUSCLES

	Please answer the questions feel the muscle on either side of the BACKBONE between the spinous and transverse process Where options given choose one and where no options, indicate by write **Y/N (YES / NO)**			
Nr of goats ↓	Are the loin muscles **shallow?**	Are the loin muscles **Moderate?**	Are the loin muscles **full? / Full developed?**	
1	Y			1
2	Y			1
3		Y		2
4	Y			1
5			Full	3
6	Y			2
7		Y		2
8	Y			1
9	Y			1
10	Y			1
11	Y			2
12	Y			1
13		Y		2
14		Y		2
15			Full	3
16			Full	3
17		Y		2 (male)

18		Y		2
19		Y		2
20	Y			1
21		Y		2
22	Y			1
23			Full	3
24	Y			1
25			Full	3
26		Y		2
27		Y		2
28		Y		2
29		Y		2
30			Full	3

Conducted by: Amon, Reinhold, Yaara & Tiago

APPENDIX 4

Tick & its control methods: Cost and benefit Analysis

Farmer Name:

Village:

Interview Questions

1. Do you experience any ticks problem in you livestock?

2. Why they are problem?……

…….

3. Do they have a certain season when they break out?

……..

4. Does the increase in ticks' infestation affect the marketing value?

   YES / NO

a) When there is ticks infestation: price range from N$……to N$……

b) When free: the price range from N$……to N$…….

5. What method did you use to control ticks on your livestock specifically goats?
   ……..

6. If oil, how much did the oil cost?
   N$……to N$……..

7. Describe your application method……
……
…

…….

8. How much time it requires you to apply oil to all goats?

   0-5 minutes 6-10 minutes 11-15 minutes 16 and above

9. How often

   Once a day Twice a day Three times a day More than

10. How fast it can take for the ticks to fall off?

…. Day 1 week 2 weeks 3 weeks 4 weeks max time

11. Do you aware of any negative impact that oil may have

a. In the environment?

Yes/No

If yes, what?…….

b. At the animal it self?

Yes/No

If yes, what?……..

APPENDIX 5

Mr. Vries Wellem's background on Livestock farming

Mr. Vries is a farmer living at Homeb settlement, which is found upriver from Gobabeb. During my visit we had discussions about ticks as a problem hampering the livestock production system along Kuiseb River and also to introduce him to EM technology. Mr. Vries emphasises that this year he experienced more tick infestation on his goats than the past years.

Mr. Vries said he grew up with livestock and knows a lot about farming. He has been considered the use of old engine oil when he observes ticks on his goat herd. In 1999, he said that he have tried to use one type of chemical pesticide (name unknown). When he applied it on goats, the pesticide burns the animals' hairs out completely when it came into contact with the skin so he stopped it.

Last year, he discovers from other farmer that grease and deadline can also be used as to control ticks in livestock. Because oil takes so long to remove ticks and he also want to better help his goats, he started using them. This year he is using OEO because he does not have enough money to purchase deadline or grease.

Figure 14: Ear of the goat damaged by ticks.

Mr. Vries said that he is aware of effects that oil and pesticides may have on the animals itself, environment in which it is applied as well as to other domestic animals and people. Even though he couldn't stop using them and watch his animals suffer without acting since there is no other possible way which he can use and doesn't posing negative effects, he said. Things like burning of animals and people skin, water and air pollution and poisonous by contact and swallowing are some effect of pesticides and other chemicals.

He is on his 60s but still farming and he has had about 37 years of livestock farming experience.

Report On Community Feedback Session

Taimi Kapalanga

A community meeting was organized after the completion of researches of the programme (GIST 2). This meeting was held on the 20th of July at the Topnaar Community Administrative office at Utuseb, situated about 50km downriver from Gobabeb. The purpose of the meeting was to share the projects findings with the Topnaar community and to get feedback on what they thought about the different projects. The feedback session was a very important component of our projects, Since the GIST 2 programme conducted experimental trials and interviews in the communities along the Kuiseb River.

After the confirmation of the date for the meeting, GIST 2 members drew a draft of expected questions that communities need to know answers to the researches conducted. Below is a highlight of aspects discussed at the meeting on each project research.

- What was your research about?
- Why did you conduct the research?
- How did you do it?
- What materials did you use and how?
- What were your findings?
- What are your recommendations to the community in regards to your findings?

The extension officer translated the meeting discussion from English to Damara/Nama since the community members are Damara/Nama speaking people.

Materials of used during the meeting were : visual aids of posters, white boards for noting during explanations and discussions, water proof maker for writing on the board, a camera (unfortunately all photos of the event were lost), posters (on individual project), and sample of EM-5 (500ml container).

Through open discussions, community members who attended the meeting aired their views and opinions on the trials conducted. They posed questions to students in

different areas of their interest. Community showed much interest and willing to know more. Here are some questions, which were asked during the meeting on different presentations

1. How did you start with the irrigation and plot treatment?
2. How did you ferment the goat manure?
3. How EM is prepared and what is in EM?
4. What can you do to pests?
5. How do you control ants?
6. Can EM be also used in controlling ticks on dogs?
7. How will you know that EM works on ticks?

There was a great deal of interest shown such as to know how to design experiments and one community member showed that he is only interested in knowing how to grow crops rather than experiment we have conducted. This reflects a need of adequate training to communities in gardening.

Figure 1: shows the community members during the meeting (source: GIST2, 2006).

Conclusion and recommendations

In conclusion, community members are willing to know what different researchers are studying, that could benefit them for development as this was observed during the meeting. Through community meeting, students have practiced their interaction skills and helped in building presentation confidence. Communities showed that they have agricultural interests and wanted to know how future researches aiming at them could involve them to gain skills. Although communities showed interests in researches that may benefit them, a lot still need to be done. Future researchers could be directly conducted in communities, so that they get involved full time, as this may be a better learning opportunities for them. This includes gardening trials, as they stressed that they do not have access to libraries for reports and a lot of them cannot read.

Future community feed back meetings could be improved through on-time arrangements, so that communities prepare themselves for turn up. Regular

announcements might be helpful, as the meeting was only announced within a short period before it was conducted. Visual aids such as power point presentations would be effective than posters, since audience cannot read posters from a distance.