

# Impact Assessment of the Community Animal Health System in Mandera West District, Kenya



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August 2009

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## Acknowledgements

The community animal health (CAH) system covered in this report was funded by the United States Agency for International Development (USAID) through the Regional Enhanced Livelihoods in Pastoral Areas (RELPA) program, Enhanced Livelihoods in the Mandera Triangle (ELMT) activity. Within ELMT, Veterinaires sans frontieres Suisse (VSF Suisse) supported the CAH system. The participatory impact assessment was conducted following a training conducted in Garissa, Kenya. Both the training and assessment were implemented by the RELPA Pastoral Areas Coordination, Analysis and Policy Support (PACAPS) activity, implemented by the Feinstein International Center, Tufts University. The assessment team acknowledges the intellectual contributions of pastoralists and community-based animal health workers in Geder, Wargudud, Kalwahil and Wangaydahan, and the valuable information provided by the Takaba and Wargudud private veterinary practitioners and the Vet Agro Company in Nairobi. We also acknowledge the support of VSF Suisse expert, Dr. Simon Chuchu, and Mr. Anis Hassan, and the support of the CARE Takaba office. The PIA training was assisted by Dr. Dawit Abebe of PACAPS and Mr. Charles Hopkins of CARE Ethiopia; Dr. Andy Catley of PACAPS provided assistance with data analysis and edited the report.

## Abbreviations

CAH	Community animal health
CAHW	Community-based animal health worker
CBPP	Contagious bovine pleuropneumonia;
CCPP	Contagious caprine pleuropneumonia
CFR	Case fatality rate
CI	Confidence interval
ECHO	European Commission Humanitarian Office
ELMT	Enhanced Livelihoods in the Mandera Triangle project
FMD	Foot and mouth disease
Ksh	Kenya shilling
NSD	Nairobi sheep disease
OIE	Office international des epizooties
PACAPS	Pastoral Areas Coordination, Analysis and Policy Support project
PPR	Peste des petits ruminants
RELPA	Regional Enhanced Livelihoods in Pastoral Areas
USAID	United States Agency for International Development

## Executive Summary

This report describes an impact assessment of a community animal health (CAH) system in Mandera West District, Kenya, which was supported by VSF Suisse/ELMT between May 2008 up to the time of the assessment in August 2009. The system involved the supply of veterinary medicines to community-based animal health workers (CAHWs) from private veterinary pharmacies, which in turn, received medicines and credit from a veterinary supplier in Nairobi. The support from VSF Suisse/ELMT included: refresher training to CAHWs in animal health care; training pharmacy staff in small business planning and management; assistance with renovation of pharmacies; facilitation of linkages between the Nairobi-based supplier and local pharmacies in Mandera West; provision of part-collateral to loans provided by the Nairobi-based supplier to the pharmacies; support to a disease surveillance system linked to local government veterinary offices.

The impact assessment focused on the financial performance and sustainability of the CAH system, and the quality of CAHW treatments. It was recognized that both financial performance and clinical competence/quality relate to overall sustainability.

### Key findings

#### *Financial performance*

By August 2009 some key achievements in terms of pharmacy development had been achieved.

- Five pharmacies received credit from the Vet Agro Company in Nairobi based on signed business agreements, and these pharmacies then acted as a source of high-quality medicines for CAHWs. On average, the CAHW veterinary stock turnover increased from 19.5% before the revitalization of the pharmacies to 80.5% at the time of the assessment.
- The monthly treatment reports for the period September 2008 to July 2009 indicated that more than 51,000 animals were treated for various diseases by the 32 CAHWs who reported to VSF Suisse; each CAHW treated around 177 cases per month. Although incomplete, financial records from showed an average monthly profit per CAHW of Ksh 2,520 (US\$35). This was considered to be a sufficient financial incentive to keep the CAHWs motivated and working, considering that they were part-time workers and also gained income from other sources.
- Knowing that the majority of the pharmacies were financially very stable, Vet Agro was planning to expand their markets in pastoral areas using a similar model.

One of the main challenges was drought in mid-2009. The number of animals treated in June and July 2009 was low compared with previous months and this was explained by drought and the movement of livestock to Ethiopia and Somalia. As herders spent a lot of money on water for the remaining livestock (within the drought-affected area), they had less to spend on veterinary care.

#### *Quality of CAHW treatments*

CAHW treatment outcomes were compared with the outcomes of treatment by untrained herd owners. The case fatality rate (CFR) was measured for different diseases affecting different livestock species in 'CAHW-treated' and 'owner-treated' animals.

- For those diseases for which a curative treatment strategy was used by CAHWs, case fatality rates in CAHW-treated herds were significantly lower than owner-treated herds (at the 95% confidence level) for 9 out of 11 diseases assessed. In terms of clinical significance, fatality following CAHW treatments was lower for all 11 diseases. When viewed in combination with the quality of the drugs which CAHWs were sourcing from private pharmacies, this result showed that for the diseases in question, CAHW treatments had far better impact on livestock survival relative to treatments administered by untrained herders.

- CAHWs also provided supportive treatments, particularly the use of antibiotic to treat or prevent secondary bacterial infections associated with viral diseases. For the five viral diseases treated in this way, a significant reduction in fatalities was evident in CAHW-treated animals for only one disease viz. Nairobi sheep disease (NSD). This result was explained by the limited biological efficacy of antibiotics in terms of preventing mortality due to viral diseases. In the case of NSD, the use of oxytetracycline by CAHWs was thought to have prevented or treated secondary pasteurellosis or certain tick-borne diseases.

### Recommendations

1. VSF Suisse should continue to support the private delivery system, linking the Vet Agro Company with the pharmacies, veterinarians and CAHWs. As the system has only been running for just over one year, further monitoring and evaluation of financial performance is needed, probably over a three to five year period, to generate information for scaling up and policy. In common with the approach used so far, VSF Suisse should avoid direct material or financial support to the pharmacies or CAHWs. VSF Suisse should also develop a clear exit strategy
2. As drought is an expected event in these areas and can impact negatively on the pharmacies and CAHWs as private operators, plans should be developed with these actors to provide veterinary care during drought. A pilot veterinary voucher scheme should be discussed and designed well in advance of drought, and VSF Suisse should liaise with UN agencies and donors to prepare potential donors of the approach. The design process should include ways to target more vulnerable community members, and a level of voucher value which is agreed with local stakeholders.
3. In terms of policy and harmonization opportunities, VSF Suisse needs to develop a clear internal organizational position, and a policy statement for public use on the role of CAHWs in the pastoralist areas where it operates, including approaches to supply CAHWs with veterinary medicines. Such a statement will assist VSF Suisse to liaise with other NGOs and UN agencies that are operating veterinary programmes in adjacent areas, especially in northern Kenya, southern Somalia and southern Ethiopian (including Save the Children US in Dollo Ado and Moyale, and CARE in Borena). Together with these other actors, VSF Suisse could jointly organize an international workshop to share lessons from this assessment on how the CAH system in Mandera West is operating, including the challenges facing the system.
4. Although the CAH system showed a strong impact on livestock mortality, there is a need to review certain aspects of the CAHW training and practice. This review should focus on the use of antibiotics by CAHWs and critically assess the justification for the use of antibiotics as supportive therapy for viral diseases. Other than NSD, this assessment showed no impact of CAHWs on viral diseases indicating that alternative strategies are needed. While some veterinarians in Kenya continue to criticize CAH systems, pastoralist livestock continue to be affected by preventable diseases with severe implications for livelihoods. For example, pox diseases, NSD and peste des petits ruminants (PPR) can all be prevented by well-designed and delivered vaccination as a routine preventive measure. Furthermore, as pastoralists are currently paying for antibiotic treatment for these diseases (with mixed outcomes) it seems likely that payment for more effective vaccines is feasible. Yet the veterinarian establishment, over decades, has failed to develop preventive strategies for these and other diseases. Basic epidemiological and economic assessments with pastoralists can clarify the demand for effective vaccination, and assist government to develop better strategies. If such strategies

could be developed and implemented, especially with private sector involvement, the need to use antibiotics in response to outbreaks of viral diseases would be reduced. The role of vaccines to reduce mortality in camel calves should be examined.

5. This assessment focused on livestock mortality and from a livelihoods perspective, the sudden or gradual loss of livestock (financial assets). This approach needs to be expanded to other VSF Suisse project areas to build a more comprehensive evidence-base, while also assessing broader impacts related to production losses. Furthermore, future assessments would benefit from assessment of equity issues, such as use of CAHWs by livestock keepers according to wealth and gender.
6. Government support to the CAH system seems to be confused, with the current CAHWs allowed to practice and submit reports, but no expansion permitted. Assuming that local government is willing, possible support to government would include assisting them to monitor the performance of private practitioners, including pharmacy staff and CAHWs, in a systematic manner. Similarly, the disease surveillance system might be strengthened by developing clear objectives for the system and testing it against the main surveillance indicators of sensitivity, specificity, timeliness, representativeness, simplicity and acceptability. However, it should be noted that a surveillance system which uses CAHWs is unlikely to be sustained unless government can respond to disease outbreaks, or ideally, prevent outbreaks.
7. USAID should review the use of their logo on private businesses and waive branding requirements in these situations; similarly, VSF Suisse should review it's own branding policy.

## 1. Introduction

### 1.1 Private veterinary practice in pastoralist areas

It has long been recognized that economically, the most feasible models for private veterinary practice in pastoralist areas involve urban-based pharmacies or clinics which support networks of veterinary paraprofessionals. These approaches recognize the relatively high transaction costs of delivering services in pastoralist areas and the reality that for most veterinary pharmacies, the volume of drug turnover is the main determinant of business viability. From the perspective of business design workers such as community-based animal health workers (CAHWs) provide an inexpensive drug delivery system and strengthen the viability of private practices run by veterinary diploma or degree holders<sup>1</sup>. In 2003 private practitioners from pastoralist areas of Ethiopia, Kenya, Somalia, Sudan, Tanzania and Uganda met to review their experiences and confirmed the importance of linkages with CAHWs or other veterinary paraprofessionals<sup>2</sup>.

In Kenya, small business development models which link urban veterinary pharmacies to CAHWs are not new. The FARM Africa approach in Meru is well documented<sup>3</sup>, as is the PAVES private veterinary practice in Kapenguria which served West Pokot pastoralist areas<sup>4</sup>. However, when this approach has been tried in more remote pastoralist districts such as Turkana, Mandera and Wajir it has been more difficult to sustain for various physical, economic and institutional reasons. Physically, these districts are large, isolated and have very weak infrastructure and therefore, transaction costs for service provision are especially high. Institutionally, various actors have been slow to move away from paternalistic, direct provision of veterinary services through aid projects. A further complication has been recurrent drought and the provision of veterinary inputs through humanitarian programmes, some of which have limited flexibility in terms of innovative private sector involvement. To some extent, veterinary voucher schemes offer a way forward in terms of targeted veterinary care during drought which works with rather than against the private sector<sup>5</sup>.

### 1.2 The VSF Suisse/ELMT project

This assessment aimed to measure the impact of the support provided by the VSF Suisse/ELMT project to the community animal health (CAH) system in northeast Kenya. It focuses on an examination of the quality and sustainability of the system. The project was implemented in the Mandera West, Garbatula, Liasanis and Wajir North Districts from May 2008 to July 2009. In the project, 32 community-based animal health workers (CAHWs) were given refresher trainings on basic animal health care, and 10 staff from five private veterinary pharmacies were given training in small-scale veterinary business planning and management methods. The pharmacy staff included the pharmacy owners viz. three veterinarians and two CAHWs. In addition, the project facilitated a credit arrangement to the pharmacies through a private company in Nairobi called the Vet Agro Company.

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<sup>1</sup> Catley, A., Leyland, T. and Kaberia, B.K. (2002). Taking a Long Term Perspective: Sustainability Issues. In: *Community-Based Animal Healthcare: A Practical Guide to Improving Primary Veterinary Services*, Catley, A. Blakeway and Leyland, T. (eds.), ITDG Publications, Rugby.

<sup>2</sup> AU/IBAR (2003). Private Veterinary Practice in Pastoralist Areas of Eastern Africa: Report of a regional workshop held in Nakuru, Kenya, 6-9 August 2003. African Union/Interafrican Bureau for Animal Resources: Nairobi, Kenya.

<sup>3</sup> Kaberia, B.K. (2002). Effectiveness and financial viability of a privatized animal health delivery system. In: *Primary Animal Health Care in the 21st Century: Shaping the Rules, Policies and Institutions*. Proceedings of an International Conference (K. Sones and A. Catley, eds.), 15-18 October 2002, Mombasa. African Union/Interafrican Bureau for Animal Resources, Nairobi.

<sup>4</sup> Ririmpoi, B. (2002). Integration of community animal health into private practice: the case of West Pokot District. In Proceedings of the 10th Decentralised Animal Health Workshop, 8-11 September, Lake Bogoria Hotel, Kenya. Community-based Livestock Initiatives Programme, Nairobi, 29-31.

<sup>5</sup> Mutungi, P.M. (2005). External evaluation of the ICRC veterinary voucher system for emergency intervention in Turkana and West Pokot Districts. International Committee for the Red Cross, Nairobi.

These activities were a response to an earlier review which indicated that some of the local veterinary pharmacies and CAHWs were operating at a very low level of activity.

The assessment was restricted to Mandera West District and specifically, the Takaba intervention site. At this site VSF Suisse supported the Takaba and Wargudud private veterinary pharmacies owned by two of the eight CAHWs who were linked to the project in those areas. In turn, the Takaba and Wargudud pharmacies were linked to the Vet Agro Company in Nairobi and also, to six CAHWs operating in the field in this area.

The specific objectives of the impact assessment were as follows.

- To assess the impact of the support provided by the VSF Suisse/ELMT project on the pre-existing CAH system in terms of changes to the financial sustainability of the system.
- To assess the quality of the treatments provided by CAHWs, with emphasis on the impact on livestock mortality.
- To draw lessons to inform future planning of CAH systems in pastoral areas.

## **2. Methods**

### **2.1 Study design**

#### *Financial sustainability*

This component of the impact assessment examined the performance of private veterinary pharmacies by reviewing information such as drug purchases and sales, and use of the pharmacies by CAHWs. Information was collected from pharmacy records and through stakeholder interviews.

#### *Quality of CAHW treatments*

This component of the impact assessment used a retrospective comparison of the impact of treatments delivered by CAHWs using local pharmacy drugs, versus treatments administered by livestock keepers using drugs purchased from other sources. The impact indicator used was the case fatality rate (CFR) for diseases treated. It was assumed that the treatments provided by CAHWs, using pharmacy drugs should have been of higher quality than treatments provided by untrained livestock keepers using drugs from other sources, such as ordinary shops and black-market dealers. Therefore, for those diseases where a curative treatment was used, the CFRs in CAHW-treated herds would be expected to be lower than CFRs in owner-treated herds.

A distinction was made between curative treatments and supportive treatments. Curative treatments were those where the therapeutic approach was directed at a primary disease agent. In the context of this assessment, supportive treatments aimed to limit the clinical impact of secondary infections. These treatments included the use of antibiotics in viral infections as a means to deal with secondary bacterial infections<sup>6</sup>. Depending on the disease in question, supportive treatments can be expected to have less impact on case fatality than curative treatments. This reflects the imperfect nature of medical therapeutics, particularly in cases where drugs to treat a primary disease agent are not available.

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<sup>6</sup> Supportive treatments can also include the use of rehydration solutions or vitamins, but these kinds of treatments do not apply to the CAH system.



## 2.2 Data collection

The data collection methods were designed with VSF Suisse staff based in Nairobi, Wajir and Takaba, who were previously involved in the design and implementation of the ELMT project. The impact assessment was conducted in August 2009 by a team of three veterinarians and a veterinary assistant; a veterinarian from PACAPS (who spoke Somali and Oromo), and three VSF Suisse staff. VSF Suisse project documents were reviewed to provide information on project activities.

### *Key informant interviews*

Key informant group and individual interviews were used to collect information as follows.

- The availability of basic animal health services in their area.
- Livestock movement radius and coverage of the CAHW service.
- Limitations of the CAHW service delivery system and suggestions for improvement.

### *Methods with CAHWs*

Information was collected from CAHWs as follows.

- Simple scoring of drug suppliers/sources to show replenishment of their veterinary drugs before and after the VSF Suisse/ELMT project support.
- Matrix scoring of different drug sources against four indicators viz. accessibility, affordability, quality and availability.
- Simple scoring of preferences for different types of antibiotics sourced from the pharmacies.
- Interviews to examine the advantages and disadvantages of being a CAHW.

### *Proportional piling to estimate case fatality rate (CFR)*

Proportional piling was used with livestock keepers to estimate case fatality rates (CFRs)<sup>7</sup>. The method was designed so that these informants could describe specific variables by livestock species.

- The proportion of the herd which became sick during the observation period of September 2008 to July 2009, and then, the specific diseases which were diagnosed by either CAHWs or owners based on clinical information.
- The proportion of sick animals treated by disease, and type and source of drugs administered by either a CAHW or livestock keeper.
- The proportions of treated animals which died and survived, by disease and according to treatment by a CAHW or livestock keeper.

The proportional piling method was standardized and adapted from the method which has been validated with pastoralists in east Africa. It used local disease names (Annex 1) and the data was handled as non-parametric data. Median differences in CFR by disease for CAHW-treated and owner-treated herds were calculated using Confidence Interval Analysis software<sup>8</sup>. However, a distinction was made between statistical significance and clinical significance: *'Statistical significance tests give an indication of the probability that observed differences between groups are due to chance. Clinical significance concerns the relevance of findings to clinical veterinary practice. Because statistical significance is partly dependant on sample size ...it is possible that clinically important results may be overlooked because a study's sample size is too small.'*<sup>9</sup> Therefore, although the death of one camel in a herd might not register

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<sup>7</sup> The case fatality rate (CFR) for a given disease is the proportion of sick animals which die. Therefore, CFR differs from mortality rate, which measure the number of deaths in the total population due to a given disease; total population includes both sick (affected) and health (non-affected) animals.

<sup>8</sup> Altman, D.G., Machin, D., Bryant, T.N. and Gardner, M.J. (2002). *Confidence Interval Analysis* version 2. British Medical Journal Books, London.

<sup>9</sup> Thrusfield, M. (2005). *Veterinary Epidemiology*, third edition. Blackwell Publishing, Oxford.

a statistically significant result in a study, such a loss may have an economic, livelihoods or welfare significance to either the owner or the animal.

### 2.3 Sampling method and sample sizes

The Mandera West District was selected purposively from among the VSF Suisse/ELMT implementation areas. In consultation with VSF Suisse staff, the district was viewed to be representative of the project.

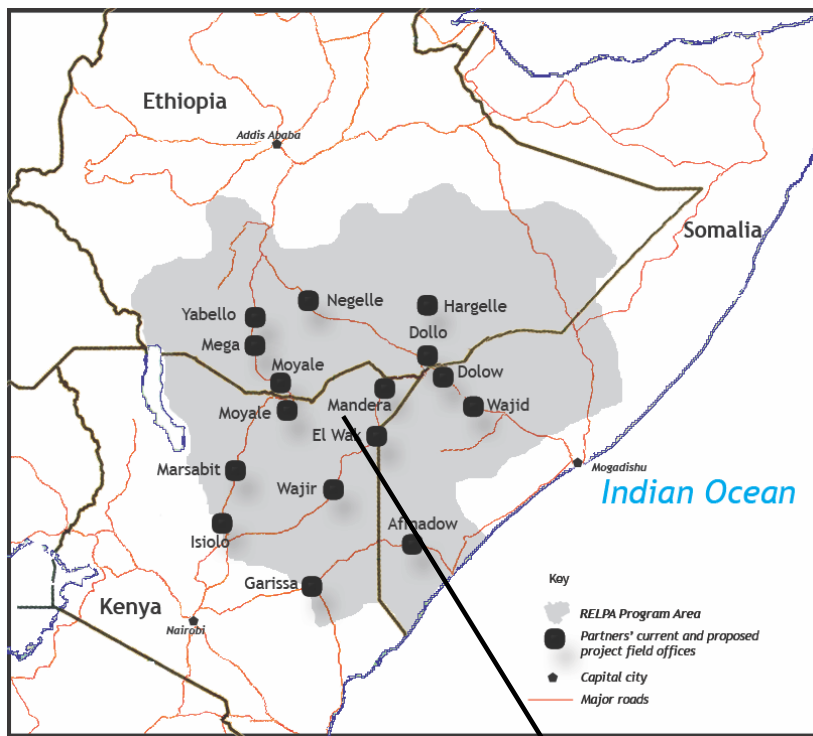
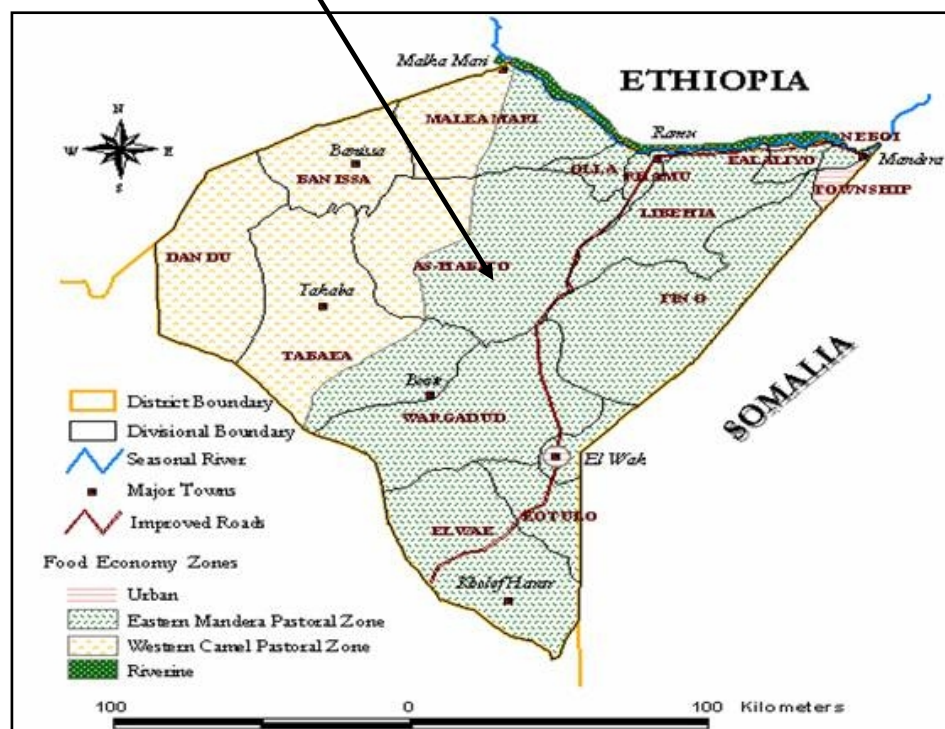


Figure 1. Maps of Kenya and Mandera District



Within time and resource limits, the intention was to conduct a detailed assessment in one area and collect systematic data on case fatality, rather than opt for a more superficial assessment across more districts. Within the district the Takaba assessment site was suggested by VSF staff because CAHWs were linked to veterinary pharmacies for drug replenishment, and also, to the District Veterinary Officer (DVO) for disease reporting. The Takaba project site was located farther from either the Mandera or Wajir VSF Suisse main field offices than any of the other sites where the project was implemented. Therefore, the Takaba site was considered an appropriate site to draw key lessons on issues related to the sustainability of a CAH system in remote pastoral areas.

Four villages were randomly selected in the district viz. Geder, Kalwahil, Wargud and Wagadahan.

- In each village 25 key informants were interviewed (total 100 informants); in both Geder and Wargud these interviews were group interviews with the 25 informants, whereas in the other villages they were individual interviews.
- A total of six CAHWs were interviewed, selected from all four villages.
- Proportional piling was conducted with the same 100 individual informants selected from the four villages; these informants represented 52 cattle herds, 77 camel herds and 94 small ruminant flocks.

### 3. Results

#### 3.1 Financial performance of pharmacies

VSF Suisse first established a CAH system in northeast Kenya in 2002, using funds from ECHO. The CAHWs were equipped with a kit of veterinary drugs and equipment valued at Ksh 40,000 (US\$556) in two rounds. A timeline of events for the overall CAH system, including support provided by the VSF Suisse/ELMT project is presented in Figure 2.

Figure 2. Timeline of key events in the CAH system

Time	Event
2002	<ul style="list-style-type: none"> <li>• VSF Suisse trained 60 CAHWs in the greater Mandera district.</li> <li>• Following the training each CAHW was given a kit of veterinary drugs and equipment of value Ksh 20,000; CAHWs were given more than eight refresher trainings between 2002 and 2006.</li> </ul>
2006	<ul style="list-style-type: none"> <li>• VSF Suisse provided a veterinary stock of value Ksh 20,000 per CAHW and also established a veterinary drug store belonging to a group of CAHWs in Mandera town, as a final means of support to the CAH system<sup>1</sup>.</li> </ul>
2007	<ul style="list-style-type: none"> <li>• VSF Suisse assessed the status of the CAH system and learned that the system had failed to operate as intended, mainly due to mismanagement of the funds provided.</li> </ul>
2008	<ul style="list-style-type: none"> <li>• The VSF Suisse/ ELMT project started and revitalized the earlier CAH system established in 2002.</li> <li>• The new project started a disease outbreak reporting system in collaboration with the district veterinary unit, using CAHWs and private practitioners.</li> </ul>
August 2009	<ul style="list-style-type: none"> <li>• VSF Suisse assessed the impact of the CAH system supported by ELMT project in collaboration with PACAPS/Tufts University (this report).</li> </ul>

#### Note

<sup>1</sup> The CAHWs who became private drug suppliers were twinned with veterinary professionals at that time mainly for the purpose of licensing their veterinary pharmacies.

The new VSF Suisse/ELMT project which started in May 2008 aimed to ensure the sustainability of the earlier system. The new project included the following support.

- Refresher training to 32 CAHWs.
- Small business planning and management training to five private veterinary practitioners, being three veterinarians and two CAHWs.
- The private practitioners were mobilized to revitalize their veterinary business using funds from their own sources, including loan stock collected from the Vet Agro Company.
- The project covered part of the cost of pharmacy renovation.

The overall approach used by VSF Suisse was to support a reliable drug supply system, mainly by facilitating business agreements signed between the Vet Agro Company and the private veterinary pharmacies; this was done in Isiolo in May 2008. VSF Suisse also acted as collateral for a portion of the loan provided by Vet Agro Company to the pharmacies, being 35 to 45% of the loan. Similarly, VSF Suisse facilitated the signing of agreements between the CAHWs and private veterinary pharmacies. Consequently, at the time of this assessment in August 2009 the Takaba and Wargudud veterinary pharmacies were using the Vet Agro Company in Nairobi for inputs while the CAHW were using drugs from the local pharmacies. The local pharmacies were selling drugs at a price that included the CAHW service charge to individual customers. By August 2009 some key achievements in terms of pharmacy development had been achieved. The pharmacies received credit from Vet Agro Company based on the business agreements signed in Isiolo. Figure 3 shows the value of the stock collected from Vet Agro Company by the pharmacies (supported by the VSF Suisse/ELMT project) between May 2008 and July 2009.

Figure 3. Private pharmacies stock replenishment performance

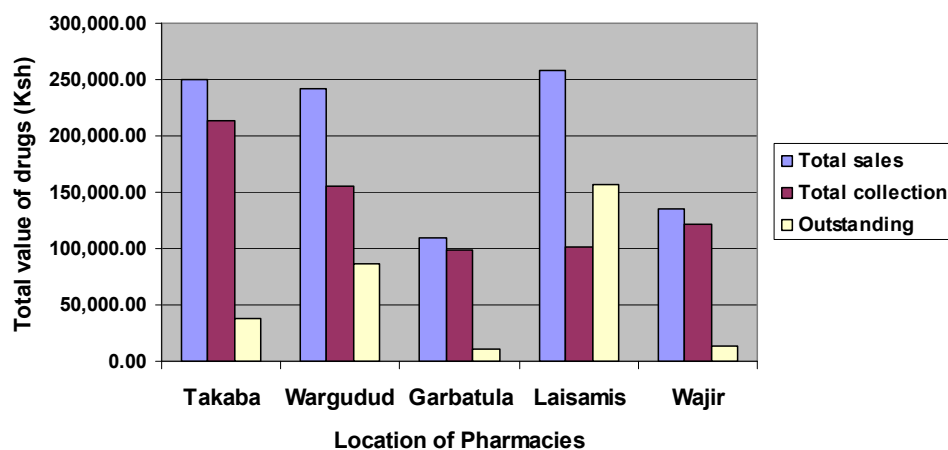
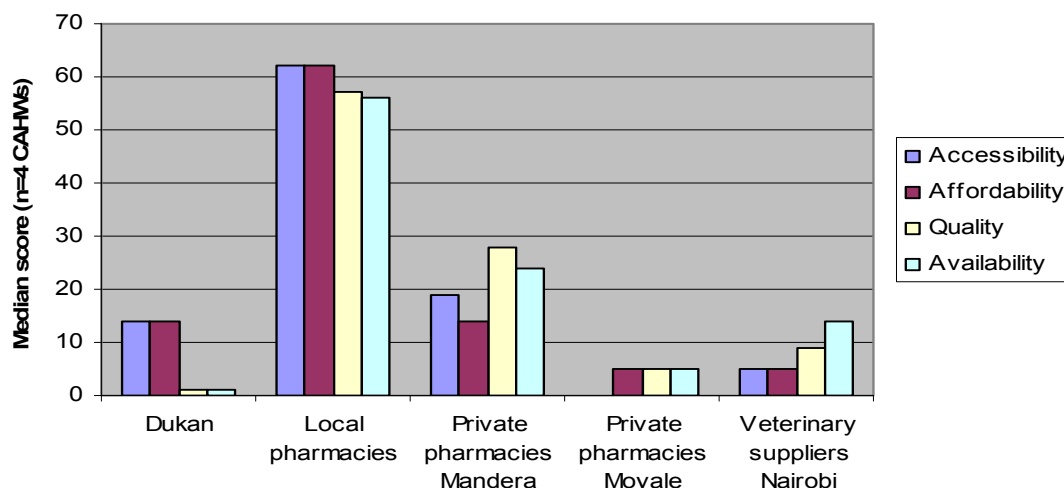


Figure 4 shows the sources of drugs used by six CAHWs involved in this assessment, before and after the revitalization of the pharmacies. Their higher preference for the price (affordability) offered by the pharmacies was explained in terms of transportation costs and other personal expenses such as food and accommodation which were incurred when visiting more distant sources in Mandera and Nairobi. Table 1 presents CAHW preferences for different antibiotics which were available from the pharmacies. On average, the CAHW veterinary stock turnover rates increased from 19.5% before the revitalization of the pharmacies to 80.5% at the time of the assessment (a 61% increase).

It was noticeable that the CAHWs interviewed prioritized the skill gained from the trainings and the social respect from their communities relative to the financial benefits gained from their services. With regards to economic benefits, the CAHWs very much disapproved of the competition from *warejis* (drugs circulated by black-market dealers) and ordinary shops selling cheap, low quality drugs.

Figure 4. CAHW preferences for veterinary drug suppliers



Note for Figure 4

Dukan – multi-purpose local shops selling veterinary medicines, usually in small quantities and without licenses or technical training.

Table 1. CAHW preferences for antibiotics

Item	Average preference score (%)	Unit price (Ksh)		Gross profit per unit	
		Purchase	Sell	Ksh	% profit
Penstrep 20%	27	286	350	64	22.4
Oxytetracycline 10%	20	120	160	40	33.3
Tylosin	20	540	600	60	11.1
Oxytetracycline 20% LA	27	286	350	64	22.4
Desseptprim tablet	7	8	10	2	25

### 3.2 Number of CAHW treatments and income

The project hired two veterinary paraprofessionals (a veterinary assistant and a livestock technician) to collect monthly treatment and disease outbreak reports forms from each CAHW and transfer them to the Nairobi office. The monitoring reports indicated that CAHW treatment figures were collected regularly from the 32 CAHWs throughout the project period. While these figures are summarized below it should be noted that the number of treatments are not related to the livestock population or disease prevalence, and therefore, provide only limited evidence of impact.

- The monthly treatment reports for the period September 2008 to July 2009 indicated that more than 51,000 animals were treated for various diseases by the 32 CAHWs who reported to VSF Suisse; each CAHW treated around 177 cases per month.
- The number of animals treated in June and July 2009 was low compared with previous months and this was explained in terms of drought. Specifically, livestock migrated to Ethiopia and Somalia and because herders spent a lot of money on water for the remaining livestock (within the drought-affected area), they had less to spend on veterinary care.
- Incomplete financial records from the project were available but showed an average monthly profit per CAHW of Ksh2,520 (US\$35).

### 3.3 Disease reporting by CAHWs

The VSF Suisse/ELMT project started an animal disease surveillance system based on CAHW reports. In the system the CAHWs were responsible for collecting information on outbreaks of diseases listed

by the Office international des epizooties (OIE), using reporting forms developed by VSF Suisse and submitting them to the DVO each month. The system started in May 2009 and up to the end of July 2009 the CAHWs submitted seven disease outbreak reports.

### 3.4 Quality of CAHW treatments

A summary of the impact of CAHW treatments on CFRs is presented in Table 2.

Table 2. Statistical and clinical reductions in case fatality rates in livestock herds treated by CAHWs compared with owner-treated herds

Curative or supportive treatments by disease	Sheep and goats		Camels		Cattle		All species	
	Statistical reduction in CFR	Clinical reduction in CFR	Statistical reduction in CFR	Clinical reduction in CFR	Statistical reduction in CFR	Clinical reduction in CFR	Statistical reduction in CFR	Clinical reduction in CFR
<u>Curative:</u>								
Helminthosis	Yes	Yes	Yes	Yes	Yes	Yes	3/3	3/3
Mange	Yes	Yes	Yes	Yes	-	-	2/2	2/2
Trypanosomosis	-	-	No	Yes	Yes	Yes	1/2	2/2
CCPP	Yes	Yes	-	-	-	-	1/1	1/1
CBPP	-	-	-	-	Yes	Yes	1/1	1/1
Respiratory disease	-	-	Yes	Yes	-	-	1/1	1/1
Tick-borne disease	No	Yes	-	-	-	-	0/1	1/1
<i>Total</i>							9/11	11/11
<u>Supportive:</u>								
Pox diseases	No	Yes	No	Yes	-	-	0/2	2/2
PPR	No	No	-	-	-	-	0/1	0/1
NSD	Yes	Yes	-	-	-	-	1/1	1/1
FMD	-	-	-	-	No	No	0/1	0/1
Paralysis, camels	-	-	No	Yes	-	-	0/1	1/1
<i>Total</i>							1/6	4/6

#### Notes

Curative treatments aim to kill the primary disease agent, such as a bacterium (e.g. through the use of antibiotic) or parasite (e.g. through the use of anthelmintic). For most infectious diseases curative treatment should result in lower CFRs (fewer deaths) than supportive treatments.

Supportive treatments, in the context of this assessment, mainly involved the use of antibiotics to treat bacterial infections which were secondary to viral infections. This approach is used when anti-viral drugs are not available and assumes that some deaths result from the secondary bacterial infections. As the primary cause of disease is not treated, in general, supportive treatments result in higher CFRs (more deaths) than curative treatments.

#### *Case fatality rates in sheep and goats*

CAHWs provided curative treatments for four diseases or disease groups viz. contagious caprine pleuropneumonia (CCPP), mange, helminthosis and protozoal tick-borne diseases, and supportive treatments for three diseases viz. Nairobi sheep disease (NSD), sheep and goat pox and peste des petits ruminants (PPR)(Table 3).

For three out of four diseases where curative treatments were used by CAHWs, CFRs were significantly lower in CAHW-treated cases relative to cases treated by livestock keepers. CAHW-treated cases of NSD also showed a significantly lower CFR relative to cases treated by livestock keepers. Furthermore, these median reductions in CFR were substantial: 31.6% for CCPP; 33.3% for mange; 21.4% for helminthosis and 33.9% for NSD. For tick-borne disease, sheep and goat pox, and 'other diseases', CFRs were lower in CAHW-treated herds. Compared with CFRs in owner-treated

herds these changes were not statistically significant, but were clinically significant. For PPR (supportive treatment), CFRs were higher in CAHW-treated herds.

Table 3. Comparison of case fatality rates in sheep and goats following CAHW and owner treatments

Disease	CAHW treatments		Owner treatments		Median difference in case fatality rates (%) (95% CI)
	Median case fatality rate (%)	Type of medicine and strategy <sup>a</sup>	Median case fatality rate (%)	Type of medicine	
CCPP	28.5 (n=84 flocks)	Oxytetracycline, curative	63.4 (n=36 flocks)	Tetracycline capsule	31.6 (20.5, 41.7)*
Mange	4.9 (n=36 flocks)	Ivermectin, curative	40.0 (n=11 flocks)	Diazinon spray	33.3 (15.4, 47.6)*
Tick borne disease <sup>b</sup>	37.9 (n=16 flocks)	Oxytetracycline, curative	58.3 (n=6 flocks)	Oxytetracycline	10.6 (-27.5, 53.3)
NSD	48.3 (n=36 flocks)	Oxytetracycline, supportive	91.7 (n=14 flocks)	Oxytetracycline	33.9 (16.0, 54.6)*
Helminthosis	10.5 (n=29 flocks)	Albendazole, curative	50.0 (n=11 flocks)	Albendazole or tetramisole	21.4 (12.5, 50.0)*
PPR	59.2 (n=50 flocks)	Tylosin, supportive	42.9 (n=11 flocks)	Dihydrostreptomycin tablets	4.6 (-14.3, 26.7)
Sheep and goat pox	23.9 (n=28 flocks)	Oxytetracycline, supportive	34.9 (n=19 flocks)	Not treated	11.1 (-25.9, 2.6)
Other <sup>c</sup>	19.3 (n=32 flocks)	Various, supportive and curative	33.3 (n=15 flocks)	Various	2.9 (-31.9, 11.1)

#### Notes

\* Significant at the 95% confidence level, using confidence interval analysis.

<sup>a</sup> Supportive treatments used in viral infection and involved the use of antibiotic to treat secondary bacterial infections.

<sup>b</sup> Assumed to be babesiosis or anaplasmosis.

<sup>c</sup> Other diseases were footrot, lice infestation, botulism, bloat, 'swollen head' and non-specific abortion.

CCPP – contagious caprine pleuropneumonia; NSD – Nairobi sheep disease; PPR – peste des petits ruminants

### *Case fatality rates in camels*

CAHWs provided curative treatments for five diseases or disease-forms viz. acute trypanosomosis, chronic trypanosomosis, respiratory disease (coughing), mange and helminthosis, and supportive treatments for one disease viz. camel pox (Table 4). For three out of five diseases where curative treatments were used by CAHWs, CFRs were significantly lower in CAHW-treated cases relative to cases treated by livestock keepers. These median reductions in CFR were substantial: 25.0% for respiratory disease; 42.9% for mange; and 43.2% for helminthosis. For trypanosomosis (acute and chronic), camel pox, paralysis and 'other' diseases, CFRs were lower in CAHW-treated herds. Compared with CFRs in owner-treated herds these changes were not statistically significant, but were clinically significant.

### *Case fatality rates in cattle*

CAHWs provided curative treatments for three diseases viz. trypanosomosis, contagious bovine pleuropneumonia (CBPP) and helminthosis. For all three diseases there was a significantly lower CFR in CAHW-treated herds relative to owner-treated herds (Table 5). For 'other' diseases there was a lower CFR in CAHW-treated herds which was clinically, but not statistically, significant.



Table 4. Comparison of case fatality rates in camels following CAHW and owner treatments

Disease	CAHW treatments		Owner treatments		Median difference in case fatality rates (%) (95% CI)
	Median case fatality rate (%)	Type of medicine and strategy <sup>a</sup>	Median case fatality rate (%)	Type of medicine	
Trypanosomosis, chronic	3.8 (n=40 herds)	Quinipyramine sulphate, curative	10.0 (n=16 herds)	Diminazine aceturate	4.0 (-8.0, 11.0)
Trypanosomosis, acute	31.0 (n=44 herds)	Quinipyramine sulphate, curative	50.0 (n=15 herds)	Isometidium chloride or diminazine aceturate	25.0 (0.0, 50.0)
Respiratory disease	17.2 (n=30 herds)	Oxytetracycline, curative	47.2 (n=12 herds)	Tetracycline capsule	25.0 (5.7, 50.0)*
Mange	0.0 (n=34 herds)	Ivermectin, curative	42.9 (n=7 herds)	Diazinon spray	42.9 (15.4, 86.5)*
Helminthosis	8.6 (n=35 herds)	Albendazole, curative	55.6 (n=11 herds)	Albendazole or tetramisole	43.2 (14.8, 58.3)*
Camel pox	38.5 (n=27 herds)	Oxytetracycline, supportive	40.0 (n=17 herds)	Not treated	5.9 (-13.9, 20.4)
Other <sup>b</sup>	25.0 (n=49 herds)	Various, curative and supportive	33.3 (n=31 herds)	Various	1.7 (-26.7, 5.0)

Notes

\*Significant at the 95% confidence level, using confidence interval analysis.

<sup>a</sup>Supportive treatments used in viral infection and involved the use of antibiotic to treat secondary bacterial infections.

<sup>b</sup>Other diseases were wounds, lice infestation, botulism, bloat, eye injuries and infections, non-specific abortion and plant poisoning.

Table 5. Comparison of case fatality rates in cattle following CAHW and owner treatments

Disease	CAHW treatments		Owner treatments		Median difference in case fatality rates (%) (95% CI)
	Median case fatality rate (%)	Type of medicine and strategy <sup>a</sup>	Median case fatality rate (%)	Type of medicine	
Trypanosomosis	0.0 (n=12 herds)	Isometidium chloride, curative	100 (n=6 herds)	Isometidium chloride	100 (64.3, 100.0)*
CBPP	27.5 (n=10 herds)	Oxytetracycline, curative	62.5 (n=9 herds)	Oxytetracycline	30.9 (8.3, 51.4)*
Helminthosis	0.0 (n=31 herds)	Albendazole, curative	40.0 (n=11 herds)	Albendazole or tetramisole	33.3 (2.5, 40.9)*
FMD	9.5 (n=13 herds)	Oxytetracycline, preventive	3.9 (n=11 herds)	Not treated	0.0 (-13.1, 17.7)
Other	33.3 (n=31 herds)	Various, curative and supportive	40.0 (n=25 herds)	Various, curative and supportive	15.6 (0.0, 33.3)

Notes

\* Significant at the 95% confidence level, using confidence interval analysis.

<sup>a</sup>Supportive treatments used in viral infection and involved the use of antibiotic to treat secondary bacterial infections.

<sup>b</sup>Other diseases were lice infestation, botulism, bloat and eye injuries and infections.

CBPP – contagious bovine pleuropneumonia; FMD – foot and mouth disease



### 3.5 Areas for improvement

Table 6 describes some of the limitations of the CAH system identified by stakeholders, how these limitations affected the performance of the program, and suggestions for improvements or better options for future interventions. The Table summarizes comments by stakeholders including beneficiaries, CAHWs, private veterinary practitioners, VSF Suisse staff and the members of the assessment team.

Table 6. Stakeholder review of CAH system

Limitations	Suggestions
<p>VSF Suisse has not been effectively utilizing information from CAHWs monthly treatments reports to provide on-the- job training to them. Therefore, some of the CAHWs had some knowledge gaps:</p> <ul style="list-style-type: none"> <li>✓ using antibiotic drugs against some untreatable diseases;</li> <li>✓ administering dihydrostreptomycin tablets orally to adult ruminants;</li> <li>✓ knowledge gaps on camel diseases.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Train VSF and government staff on participatory monitoring techniques as part of their CAHW training-of-trainers course;</li> <li>✓ Further training for all CAHWs by experienced veterinarian focusing on camel health problems and treatments, particularly correct use of antibiotics.</li> </ul>
<p>VSF Suisse worked with only eight CAHWs out of around 16 CAHWs that used the private veterinary pharmacies:</p> <ul style="list-style-type: none"> <li>✓ the coverage of the CAHWs service was very poor;</li> <li>✓ consequently, pastoralists continued using low-quality drugs from ordinary shops and black-market dealers, as well as using incorrect treatment procedures such as administering penicillin-streptomycin by intravenous injection.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Include the other CAHWs in future refresher training;</li> <li>✓ Train additional CAHWs on cost sharing basis. The CAHWs need to cover the kit cost and this requires the community to look for better-off members during selection<sup>10</sup>.</li> </ul>
<ul style="list-style-type: none"> <li>✓ The private pharmacies were selling high-quality drugs from the European company Norbrook Ireland.</li> <li>✓ They sold short-acting antibiotic drugs such as 10% oxytetracycline, Penstrep, Deseptoprim tablets and Tylosin together with 20% long acting oxytetracycline, and this has technical problems.</li> <li>✓ The pharmacies were forced to follow pastoralists' preference for short-acting drugs partly due to the lower price<sup>11</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Strong training for private practitioners on drug prescription and handling matters.</li> <li>✓ Mass education on drug- related issues to pastoralists.</li> </ul>
<p>The presence of the donor and VSF Suisse logos on the wall of the pharmacies meant that the communities and some of the CAHWs thought that the pharmacies were selling donated (free) drugs at commercial prices to make a profit; this affected the normal client relationships to some extent.</p>	<ul style="list-style-type: none"> <li>✓ Erase the logos and make all stakeholders aware that the drugs in the pharmacies are purely private property.</li> </ul>

<sup>10</sup> The members of the communities involved in this assessment suggested that any additional CAHWs trained may need to cover the kit cost especially of veterinary drugs.

<sup>11</sup> There seems to be limited justification for selling 10% oxytetracycline to CAHWs.

## 4. Discussion

### 4.1 Methodological issues

#### *Timing of the assessment*

The assessment was conducted during the peak of the long dry season in August 2009. Therefore, although a sampling list of informants was available for the purpose of making a random selection of informants, it was not possible to locate or meet most of the people selected from the list. Furthermore, it was not possible to identify herds which had received no treatments and which might have acted as a control group for the assessment. In part, these limitations were overcome by comparing CAHW-treated and owner-treated animals; when using the proportional piling method, informants confidently provided this information. In addition, the CFR data was handled as non parametric data.

#### *Disease diagnosis, recall issues and case fatality rates*

The proportional piling method for estimation of CFR partly depends on the ability of informants to diagnose livestock diseases with reasonable accuracy. Such diagnosis uses their clinical observations and recognition of epidemiological factors such as the seasonal occurrence of disease, contact between herds, exposure to disease vectors and other factors. The clinical diagnostic skills of pastoralists have been shown to be similar to those of veterinarians<sup>12</sup>.

A retrospective assessment design can be hindered by recall bias. Here we assumed that any inaccuracies in remembering treatment outcomes (deaths and survivors) would apply similarly to both CAHW-treated and owner-treated herds. Ideally, CFR results from CAHW-treated herds would have been cross-checked against complete CAHW treatment records for those herds, and details of drug administration by species, disease, proportion of animals treated and volumes and routes of drug administration. This level of detailed information was not available.

A further means of cross-checking was a comparison of the CFRs reported by pastoralists, with the literature on livestock diseases in pastoral areas. A comparison based on an initial, brief literature search is provided in Annex 2 but affords only a very approximate means of validating the CFR data in this report. This is because none of the literature refers specifically to the Mandera West area and case fatality varies according to biological variation in disease severity due to pathogen virulence, and factors such as the endemic or epidemic nature of a disease in a given area. Therefore there is no standard CFR for a given disease in a particular species and for most cases, a broad range of CFRs. Rather than using the specific figures reported in the literature it is probably more useful to compare the data by categorizing CFRs using terms such as 'high' (e.g. CCPP, NSD, PPR, trypanosomosis), 'moderate' (e.g. mange, sheep and goat pox, camel pox) and 'low' (e.g. FMD).

Another means of cross-checking would be to compare the outcome of CAHW treatments with treatments provided by veterinarians, with the latter acting as a gold standard treatment. Initially, the assessment was designed to assess herder preferences for different animal health service providers and therefore, had scope to compare CAHW and veterinarians. However, it became evident that there were no other service providers in the area apart from the CAH system supported by VSF Suisse / ELMT, and the private pharmacies that belonged to the CAHWs.

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<sup>12</sup> Catley, A. (2006). The use of participatory epidemiology to compare the clinical veterinary knowledge of pastoralists and veterinarians in East Africa. *Tropical Animal Health and Production* 38, 171-184.

## 4.2 Impact assessment findings

The impact assessment focused on the financial performance of the veterinary pharmacies supported by VSF Suisse/ELMT with a view to learning lessons on the financial sustainability of the CAH system. It also examined the quality of CAHWs by measuring the outcome of CAHW treatments using CFR estimates. Quality also relates to sustainability, because a good quality service which delivers reliable outcomes is more likely to be used by clients, especially if the quality exceeds self-treatments by livestock owners.

In terms of CAHW quality, the field assessment covered only the Takaba intervention site. VSF Suisse should conduct similar assessments in other operational areas to generate a complete picture of the CAHW treatment issues and related training and technical support needs.

### *Financial sustainability of CAHWs linked to private pharmacies*

Before the current project started in 2008, VSF Suisse had previously established a veterinary drug shop in Mandera town which was managed by CAHWs operating around Mandera as a group business. The 60 CAHWs trained in the project intervention areas were linked to the drug shop for replenishing their drugs, and in 2006, were given additional stock valued at Ksh20,000 (US\$278) per person. When VSF Suisse assessed the system in 2007 it was not operating and the main reason for the failure was misuse of the revolving funds injected into the group business, by the CAHWs who were responsible for its management. These experiences are similar to those seen in other service delivery models based on collective ownership of a system.

Although the VSF Suisse/ELMT project had been operating for only a year at the time of this assessment, the more commercially-minded approach taken by the project was showing good results. For example, 32 CAHWs secured veterinary drugs while the five private veterinary practitioners had injected a substantial amount of stock into their businesses by using their own capital. On average, these independent investments amounted to between Ksh200,000 (US\$2778) and Ksh400,000 (US\$5556), including the loans provided by the Vet Agro Company. Some CAHWs had collected a stock of value Ksh 5,000 (US\$70) to Ksh10,000 (US\$140) from the local pharmacies on a loan basis. The VSF Suisse/ELMT project contributed to the renovation costs of the pharmacies.

In terms of CAHW monthly income derived from veterinary activities, a limited analysis of CAHW records showed an average profit of Ksh2,520 (US\$35) per month. Although a more comprehensive review is needed which takes account of seasonal variations in income and drought, this figure is far higher than the monthly income received by CAHWs in Mwingi District in 2004<sup>13</sup> and indicates a sufficient financial incentive to sustain part-time CAHWs in Mandera West.

The Vet Agro Company in Nairobi is willing to continue to provide credit services to the local pharmacies as required. Knowing that the majority of these pharmacies are financially very stable, the company aims to use these local private practitioners to expand their markets in pastoral areas including the southern part of Somalia and Ethiopia. In this regard, VSF Suisse have played an important role in linking the larger company to the local pharmacies. The private pharmacies were also supplying high-quality veterinary drugs to CAHWs, thereby assisting the overall quality of the CAH system in the areas covered. Overall these experiences agree with other financial assessments

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<sup>13</sup> Rubyogo, J.C., Murithii, P.M., Agumbah, G.J.O. and Obhai, G. (2005). Sustainability of a privatized community-based animal health worker system in Mwingi District, Kenya. *Tropical Animal Health and Production* 37, 253-266.

and studies in Kenya which examine the financial sustainability of CAH systems involving private pharmacies as the main local source of veterinary drugs<sup>14</sup>.

In Kenya, clinical animal health service delivery requires veterinary workers to source inputs from private suppliers. However, the more reputable suppliers are located in the main urban centers and in pastoralist areas a highly unethical trade in veterinary drug supply has evolved, with consequent risks of drug misuse. Due to the absence of properly regulated and licensed sources of veterinary drugs, various petty traders and untrained practitioners have stepped in to fill the gap. This is unacceptable from a legal and ethical perspective, yet it is clearly the role of government veterinarians and related agencies to ensure quality control of veterinary drugs in the country.

In the CAH system covered in this assessment, the private veterinary practitioners and the CAHWs invested their own capital to establish or revitalize pharmacies and acquire stocks of drugs. This indicates a strong personal commitment to these businesses. However, the private practitioners and CAHWs were concerned that it may be difficult for them to compete with other private practitioners (including other CAHWs) who receive material and financial supports from NGOs operating in the adjacent areas. In addition, during drought their stocks of veterinary drugs can expire as livestock move to neighboring countries, and free drugs that may be delivered in response to drought by NGOs, UN agencies or the Government of Kenya. These findings point to a need to support the CAH and private pharmacy system in times of drought with veterinary voucher schemes, which have already been piloted in pastoral areas of Kenya and are a better alternative to free drug distribution<sup>15</sup>.

Similarly, some pastoralists stated that CAHWs were not always available where needed most, especially at times of drought when herds migrate to Ethiopia and Somalia. The CAHWs indicated they follow herds to Ethiopia during normal years. Within Ethiopia there is a promising trend towards more use of local, private sector workers to implement emergency veterinary interventions in pastoral areas. This indicates a need for cross-border harmonization of CAH systems in normal periods, plus harmonization of veterinary voucher schemes or similar approaches during drought.

### *Quality of CAHW treatments*

During the last two decades there has been considerable debate in the veterinary establishment in Kenya over the use of CAHWs. One aspect of the debate has focused on the ability of CAHWs to diagnose diseases and use veterinary medicines correctly. Although there is no standard method of measuring CAHW clinical competence, various studies in Kenya have shown that when well-trained and supervised, CAHWs can provide a sufficient level of clinical competence and have positive impact on livelihoods<sup>16</sup>. In contrast, there seem to be no studies available which reach an opposite conclusion.

This assessment examined the impact of CAHW treatments on livestock fatality and did not measure production-related losses or impacts. The post-treatment fatality rates in CAHW-treated herds in this

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<sup>14</sup> Some key references are:

Kaberia, B.K. (2002). *ibid*.

Ririmpoi, B. (2002). *ibid*.

Leonard D.K. (1987). The supply of veterinary services: Kenyan lessons. *Agric. Admin. Extens.* 26 (4), 219-236.

Okwiri F.O., Kajume J.K. and Odondi R.K. (2001). An assessment of the economic viability of private animal health service delivery in pastoral areas in Kenya. African Union/Interafrican Bureau for Animal Resources, Nairobi, 80 pp.

<sup>15</sup> *Livestock Emergency Guidelines and Standards* (2009). <http://www.livestock-emergency.net>

<sup>16</sup> Key references include:

Odhiambo O., Holden S. and Ackello-Ogutu C. (1998). Oxfam Wajir pastoral development project: an economic impact assessment. Oxfam UK/Ireland, Nairobi, 23 pp.

Rubyogo, J.C., Muriithii, P.M., Agumbah, G.J.O and Obhai, G. (2005). Assessment of the Technical Competence and Ethical Behaviour of Community-based Animal Health Workers in Mwingi District, Kenya. *Tropical Animal Health and Production* 37(4), 267-276.

assessment agree with earlier studies which show that CAHWs can diagnose and treat diseases correctly. The assessment showed that CAHW treatments are not perfect but this finding is not surprising - no clinical service in either animal health or human health, anywhere in the world, will produce complete cure rates – this is the nature of clinical medicine. While the veterinary establishment in Kenya continues to block CAH systems at policy and legislative levels, it would be useful to assess the clinical competence of veterinarians and compare this to para-veterinary professionals such as CAHWs. Such a study would no doubt reveal that clinical competence not only relates to level of training, but also, to hands-on clinical experience. Until the veterinary profession in Kenya opens itself up to such scrutiny, it remains debatable where the technical competence really resides. There is no system in the veterinary board in Kenya for reassessment of veterinarian's clinical knowledge over time, no system for continuing professional development and few, if any, examples of veterinarians being disciplined or removed from the veterinary register.

Looking specifically at the CFR results, in general the curative treatments provided by CAHWs resulted in significantly fewer livestock deaths compared to treatments administered by herd owners (Table 2). Furthermore, the reductions in CFR arising from CAHW treatments were often substantial (Tables 3 to 5). For example, CAHW had dramatic impact on mortality due to trypanosomosis in cattle (Table 5). It seems reasonable to assume that this level of CAHW performance did not happen by chance, but was due to a combination of knowledge and skills acquired through training, and the correct use of appropriate veterinary drugs. For camel diseases, the assessment findings agreed with earlier studies in Kenya. For example, a comparison of camel herds with and without veterinary care in northern Kenya showed that mortality due to disease in calves was 44.8% in untreated herds but only 5.4% in treated herds. In adult camels, mortality due to disease was 26.7% in untreated herds and 4.3% in treated herds<sup>17</sup>.

Although the assessment did not aim to directly measure livelihoods impact of CAHW activities, disease such as trypanosomosis, helminthosis, CBPP, CCPP and mange have been reported in Somali pastoral areas since the 1940s and are known to have important impacts in terms of production (e.g. milk, fertility) and mortality. For poorer households who rely more on sheep and goats, CCPP, PPR, helminthosis and NSD are important diseases with CCPP, PPR and NSD causing high mortality and therefore, loss of key assets; NSD causes higher mortality in sheep and goats in Africa than any other infectious disease.

In the case of CBPP there are mixed opinions among veterinarians concerning the use of antibiotics to treat this disease, often based on concerns that the use of antibiotics encourages carrier status and makes eradication more difficult in the long term. More recent studies contest this view. For example: there appears to be no scientific evidence that the treatment of CBPP cases with antibiotics results in carrier status<sup>18</sup> and antibiotics have been shown to be beneficial in limiting the impact of the disease<sup>19</sup>. Oxytetracycline has been used to treat CCPP for many years. In central Somalia in the late 1980s it was considered to be an effective treatment<sup>20</sup> and more recent research has indicated the value of

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<sup>17</sup> Simpkin, P.S. (1985). The effects of disease as a constraint to camel productivity in northern Kenya. MPhil. Thesis, University of London.

<sup>18</sup> Mariner, J.C., McDermott, J., Heesterbeek, J.A.P., Thomson, G., Roeder, P.L. and Martin, S.W. (2006). A heterogeneous population model for contagious bovine pleuropneumonia transmission and control in pastoral communities of East Africa. *Preventive Veterinary Medicine* 73/1, 75-91.

<sup>19</sup> Otto J.B. Huebschle, Roger D. Ayling, Kevin Godinho, Obed Lukhele, Georgina Tjipura-Zaire, Tim G. Rowan, Robin A.J. Nicholas (2006). Danofloxacin (Advocin) reduces the spread of contagious bovine pleuropneumonia to healthy in-contact cattle. *Research in Veterinary Science* 81, 304–309.

<sup>20</sup> In 46/47 reports where information on the efficacy of oxytetracycline was available, the treatment was reported as efficacious. The reference is:

Baumann, M.P.O. (1990). The Nomadic Animal Health System (NAHA-System) in Pastoral Areas of Central Somalia and Its Usefulness in Epidemiological Surveillance. MPVM thesis, University of California, Davis.

danofloxacin to treat CCPP<sup>21</sup>. On these issues the assessment team noted some misunderstandings in CAHW training courses delivered by veterinarians. For example, Tylosin is a drug of choice for use against respiratory diseases such as CCPP and CBPP but has never been used by CAHWs against these diseases. Instead it was used against viral diseases, particularly PPR, and with no impact (Table 3). This experience indicates that when veterinarians are confused about the evidence supporting a particular therapeutic option, such confusion can easily be passed on to CAHWs.

Other technical areas in need of revision in terms of CAHW training and supervision were as follows.

- Other than supportive treatment of NSD in small ruminants, there was limited evidence to show that the supportive use of antibiotics to treat viral diseases was effective - antibiotic usage had no demonstrable impact on mortality caused by pox diseases, PPR or FMD.
- The finding that the parenteral administration of oxytetracycline reduced mortality due to NSD agreed with experiences in northern Somalia, where the same drug was reported to increase survival in NSD outbreaks; this effect was attributed to prevention or treatment of secondary pasteurellosis or certain tick-borne protozoal diseases<sup>22</sup>. Further action during NSD outbreaks could include whole-herd acaricide application to reduce transmission by the tick vector.
- The CAHWs and pharmacies were selling various short acting antibiotic drugs although the correct administration of these drugs (e.g. daily treatment over three to five days) is problematic in pastoral areas<sup>23</sup>; incomplete treatment can lead to treatment failures and discourage use of CAHWs by pastoralists.
- Diarrhoea and death, probably due to enterotoxaemia, was commonly reported as a cause of camel calf mortality; this needs further investigation and follow up.
- CAHWs were trained to administer antibiotic tablets orally to young animals for diarrhoea, and use antibiotic boluses to treat retained placenta in cattle; it seems that to some extent these preparations are being administered orally to adult ruminants by pastoralists with related negative impacts.

While some stakeholders may criticize CAHWs for some of these weaknesses in clinical expertise, ultimately it is the responsibility of veterinarians to provide correct technical training, monitor CAHW performance and address any problems as they arise. Other than occasional impact assessments (such as this report) there appears to be no systematic or organized system in the government veterinary service to monitor CAHW activities or the clinical work of other private practitioners.

### ***Disease reporting and links to government***

Unfortunately the assessment team was not able to meet the DVO as he was not available. According to the CAHWs in Takaba the district veterinary unit is allowing the existing CAH system to continue, but opposes further expansion of the service e.g. by refusing to train new CAHWs. At the same time there appears to be no feasible alternative to CAHWs and therefore, the government strategy would leave many areas without CAHWs and allow informal drug sales by people with no training at all. As the results of this assessment shows (Tables 2 to 5), the use of veterinary drugs by untrained people has limited impact relative to CAHWs.

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<sup>21</sup> U. Ozdemir, G. R. Loria, K. S. Godinho, R. Samson, T. G. Rowan, C. Churchward, R. D. Ayling and R. A. J. Nicholas (2006). Effect of danofloxacin (Advocin A180) on goats affected with contagious caprine pleuropneumonia. *Tropical Animal Health and Production* 38, 533-540.

<sup>22</sup> Edelsten, R.M. (1975). The distribution and prevalence of Nairobi sheep disease and other tick-borne infections of sheep and goats in northern Somalia. *Tropical Animal Health and Production* 7/1, 29-34.

<sup>23</sup> In Maasai areas of Kenya it was noted that untrained pastoralists often administered only one dose of short-acting oxytetracycline:

Roderick, S., Stevenson, P., Mwendia, C. and Okech, G. (2000). The Use of Trypanocides and Antibiotics by Maasai Pastoralists. *Tropical Animal Health and Production* 32 (6): 361-374.

With regards to the CAH disease reporting system, such systems have considerable potential to contribute to national disease surveillance. In Tanzania for example, those pastoral districts with a CAHW reporting system out-performed all other districts in terms of report submissions<sup>24</sup> and this is one reason why the OIE supports well-trained and supervised CAHWs. The approach in Mandera is a useful start but could be strengthened by reference to the six main indicators of a surveillance system viz. sensitivity, specificity, timeliness, representativeness, simplicity and acceptability<sup>20</sup>.

### *Use of veterinary drugs by pastoralists*

In general, good CAHW training and support systems recognize that pastoralist trainees have strong diagnostic skills, and are knowledgeable on the clinical signs and basic epidemiology of many livestock diseases. In contrast, the main deficit in the knowledge of CAHW trainees is the correct use of veterinary medicines. Although the assessment did not aim to study this issue in any detail, the field work indicated that some untrained pastoralists were misusing veterinary drugs.

- Many of the pastoral informants were treating their animals using 500mg oxytetracycline capsules, administered by injection; this treatment was used particularly for respiratory problems mainly in goats and camels, and the diluted drug was directly injected into the thoracic cavity between the third and fourth ribs. On average, a single dose of 12 capsules was used to treat an adult camel and three capsules to treat an adult goat, indicating that the dose of this treatment was around 10 times higher than the 20 mg/kg body weight dosage recommended by drug manufacturers for these species. This practice needs further investigation as its widespread use indicates that herders perceive it to be beneficial.
- Some pastoralists were administering antibiotic tablets orally to adult ruminants, but also reporting that treated animals then became emaciated. This was perhaps due to damage caused to the normal rumen flora by the antibiotic.
- Pastoralists may prefer using antibiotic tablets rather than injection because oral administration is easier than injecting, and the tablets are relatively cheap.

These experiences indicate that the CAH system could be supported by mass media information campaigns or information distributed through the pharmacies, to raise awareness about the correct use of veterinary drugs.

## **5. Conclusions and Recommendations**

The impact assessment reached the following conclusions.

- The veterinary drug supply system based on rural, private veterinary pharmacies supplying CAHWs offered good potential for financial sustainability, particularly if a veterinary drug company(s)/supplier could service the pharmacies through normal business contracts and credit arrangements. The establishment of an effective CAH system without directly providing material or cash inputs into individual businesses (including CAHWs kits) is an appropriate approach both for the VSF Suisse/ELMT project and probably, within pastoral areas of Kenya more widely.
- The role of VSF Suisse/ELMT as a provider of collateral to local veterinarians and CAHWs is one of the key lessons learned from this assessment. It enabled veterinary workers who may not have otherwise afforded the initial investment required, to strengthen private veterinary business. This approach should be replicated by other NGOs with a focus on promotion of veterinary service privatization in pastoral areas. The authors understand that the mutual benefits-based collaboration between the local private drug suppliers and CAHWs is essential to ensure the sustainability of a CAH system.

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<sup>24</sup> Allport, R., Mosha, R., Bahari, M., Swai, E. and Catley, A. (2005). The use of community-based animal health workers to strengthen disease surveillance systems in Tanzania. *Office internationale des epizooties revue scientifique et technique* 24(3), 921-932. <http://www.oie.int/download/imp/primeur/pdfs%20review24-3/Allport921-932.pdf>

- The placement of USAID and VSF Suisse logos on the pharmacies was inappropriate and caused confusion at community-level, mainly due to perceptions that veterinary drugs which had been donated free of charge were being sold for personal benefit.
- The drugs and services provided CAHWs and private veterinary pharmacies, and supported by VSF Suisse/ELMT, substantially reduced disease-related livestock fatalities in pastoral livestock in the Takaba intervention area. It therefore had a positive livelihoods impact.
- As with any veterinary service delivery system, there were areas for improvement. These could be introduced into the VSF Suisse project without a major change in the overall technical approach of the project.
- The policy environment for privatized CAH systems in pastoral areas of Kenya remains confused after decades of debate and evidence-based research. As Kenya lacks a clear or evidence-based policy on these systems it continues to fall further behind other countries in the region, with important negative impacts on pastoral livelihoods in terms of scaling-up and enabling primary veterinary services, and related regional harmonization of systems.

Future needs and opportunities include:

1. VSF Suisse should continue to support the private delivery system, linking the Vet Agro Company with the pharmacies, veterinarians and CAHWs. As the system has only been running for just over one year, further monitoring and evaluation of financial performance is needed, probably over a three to five year period, to generate information for scaling up and policy. In common with the approach used so far, VSF Suisse should avoid direct material or financial support to the pharmacies or CAHWs. VSF Suisse should also develop a clear exit strategy
2. As drought is an expected event in these areas and can impact negatively on the pharmacies and CAHWs as private operators, plans should be developed with these actors to provide veterinary care during drought. A pilot veterinary voucher scheme should be discussed and designed well in advance of drought, and VSF Suisse should liaise with UN agencies and donors to prepare potential donors for such an approach. The design process should include ways to target more vulnerable community members, and a level of voucher value which is agreed with local stakeholders.
3. In terms of policy and harmonization opportunities, VSF Suisse needs to develop a clear internal organizational position, and a policy statement for public use on the role of CAHWs in the pastoralist areas where it operates, including approaches to supply CAHWs with veterinary medicines. Such a statement will assist VSF Suisse to liaise with other NGOs and UN agencies that are implementing or funding veterinary programmes in adjacent areas, especially in northern Kenya, southern Somalia and southern Ethiopian (including Save the Children US in Dollo Ado and Moyale, and CARE in Borena). Together with these other actors, VSF Suisse could jointly organize an international workshop to share lessons from this assessment on how the CAH system in northern Kenya has been reinitiated and operating, including the challenges indicated earlier.
4. Although the CAH system showed a strong impact on livestock mortality, there is a need to review certain aspects of the CAHW training and practice. This review should focus on the use of antibiotics by CAHWs and critically assess the justification for the use of antibiotics as supportive therapy for viral diseases. Other than NSD, this assessment showed no impact of CAHWs on viral diseases indicating that alternative strategies are needed. While some veterinarians in Kenya continue to criticize CAH systems, pastoralist livestock continue to be affected by preventable diseases with severe implications for livelihoods. For example, pox



diseases, NSD and PPR can all be prevented by well-designed and delivered vaccination as a routine preventive measure. Furthermore, as pastoralists are currently paying for antibiotic treatment for these diseases (with mixed outcomes) it seems likely that payment for more effective vaccines is feasible. Yet the veterinarian establishment, over decades, has failed to develop preventive strategies for these and other diseases. Basic epidemiological and economic assessments with pastoralists can clarify the demand for effective vaccination, and assist government to develop better strategies. If such strategies could be developed and implemented, especially with private sector involvement, the need to use antibiotics in response to outbreaks of viral diseases would be reduced. The role of vaccines to reduce mortality in camel calves should be examined.

5. This assessment focused on livestock mortality and from a livelihoods perspective, the sudden or gradual loss of livestock (financial assets). This approach needs to be expanded to other VSF Suisse project areas to build a more comprehensive evidence-base, while also assessing broader impacts related to production losses. Furthermore, future assessments would benefit from assessment of equity issues, such as use of CAHWs by livestock keepers according to wealth and gender.
6. Government support to the CAH system seems to be confused, with the current CAHWs allowed to practice and submit reports, but no expansion permitted. Assuming that local government is willing, possible support to government would include assisting them to monitor the performance of private practitioners, including pharmacy staff and CAHWs, in a systematic manner. Similarly, the disease surveillance system might be strengthened by developing clear objectives for the system and testing it against the main surveillance indicators of sensitivity, specificity, timeliness, representativeness, simplicity and acceptability. However, it should be noted that a surveillance system which uses CAHWs is unlikely to be sustained unless government can respond to disease outbreaks, or ideally, prevent outbreaks.
7. USAID should review the use of their logo on private businesses and waive branding requirements in these situations; similarly, VSF Suisse should review its own branding policy.

## Annex 1. Local disease names

<u>English</u>	<u>Somali</u>
CCPP	<i>Renweyne/hergeb/berfur</i>
Helminthosis	<i>Goryan/shuq</i>
Mange	<i>Chito/cadho</i>
Tick-borne disease	<i>Qalal/Kadadhig</i>
NSD	<i>Merjaqas</i>
Pox diseases	<i>Furuq</i>
Foot rot	<i>Hoko/rafdilal</i>
Lice	<i>Injir</i>
Botulism	<i>Mohogoy</i>
Bloat	<i>Dibir</i>
Abortion	<i>Seleya</i>
Camel trypanosomosis, chronic	<i>Dhukan</i>
Camel trypanosomosis, acute	<i>Gudan</i>
Respiratory disease, camel	<i>Dhugeto</i>
Paralysis, camel	<i>Medahtag/shimbir/qorjab</i>
CBPP	<i>Sombeys/berfur</i>
Trypanosomosis, cattle	<i>Sumutie/gandi</i>
LSD	<i>Kuskus/burbur</i>
Ephemeral fever	<i>Tuqma</i>
FMD	<i>Oyale/gandile</i>
PPR	<i>Qandho</i>
Wounds	<i>Neber</i>
Eye diseases	<i>Endhahanun</i>

## Annex 2. Mortality and case fatality rates

Livestock species/disease	Median case fatality rate reported in Manderla West, owner-treated herds	Mortality and case fatality rates reported in the veterinary literature
<u>Sheep and goats</u>		
Helminthosis	50.0%	Mortality varies by type of disease and age group. Type I ostertagosis causes high morbidity and low mortality; Type II ostertagosis causes low morbidity and high mortality, and therefore, a high case fatality rate <sup>1</sup> .
Mange	40.0%	Data not located.
CCPP	63.4%	Mortality from 60-100% <sup>1</sup>
Babesiosis	58.3%	Case fatality in central Somalia 59% (10%-100%) <sup>2</sup>
NSD	91.7%	No specific mortality data located. Sudden deaths can be confused with anthrax <sup>1</sup>
PPR	42.9%	Mortality up to 90% <sup>1</sup>
Sheep and goat pox	34.9%	High mortality 77 to 90%; high case fatality <sup>1</sup>
<u>Camels</u>		
Helminthosis	55.6%	Mortality varies from 5 to 80% <sup>1</sup>
Mange	42.9%	Variable depending on parasite(s), disease type, age group etc; case fatality can be high in some forms of acute disease
Trypanosomosis	10.0 to 50.0%	Case fatality rate 69% in Turkana, Kenya; generally reported to be 'high' especially in calves <sup>3</sup>
Camel pox	40.0%	High case fatality rate <sup>1</sup> ; 68.4% case fatality, Turkana, Kenya <sup>3</sup> ; death may occur after months or years; spontaneous recovery is rare <sup>4</sup>
<u>Cattle</u>		
Helminthosis	To add	5% to 30% case fatality rate <sup>1</sup> ; case fatality up to 28.5% in Somalia <sup>5</sup>
Trypanosomosis	To add	As sheep and goats.
FMD	3.8%	High case fatality in both acute and chronic forms; spontaneous recovery is rare <sup>4</sup>
CBPP	62.5%	Case fatality rates: <ul style="list-style-type: none"> <li>- Boran cattle, Ethiopia from 15.1% (&lt;2 years old) to 1.9% (4 years or older)<sup>6</sup></li> <li>- Maasai cattle, Tanzania from 21.4% (calves) to 5.5% (adults); all ages 10.8%<sup>7</sup></li> <li>- Sukuma cattle, Tanzania; all ages 1.3%<sup>7</sup></li> <li>- Fulani cattle, Cameroon reached 61% in young cattle (&lt;1 year) and 9% in adults (&gt; 2 years)<sup>8</sup></li> </ul> Mortality from 10-50% <sup>1</sup>

<sup>1</sup>Sewell, M.M.H. and Brocklesby, D.W. (eds.) (1990). Handbook on Animal Diseases in the Tropics, 4<sup>th</sup> edition. Baillière Tindall, London.

<sup>2</sup>Baumann (1990), *ibid*.

<sup>3</sup>Mochabo, K.O.M., Kitala, P.M., Gathura, P.B., Ogara, W.O., Catley, A., Eregae, E.M. and Kaitho, T.D. (2005). Community perceptions of important camel diseases in Lapur Division of Turkana District, Kenya. *Tropical Animal Health and Production* 37/3, 187-204

<sup>4</sup>Stephen, L.E. (1986). *Trypanosomiasis: A Veterinary Perspective*. Pergamon Press, Oxford.

<sup>5</sup>Jezek, Z., Kriz, B. and Rothbauer, V. (1983). Camelpox and its risk to the human population. *Journal of Hygiene, Epidemiology, Microbiology and Immunology* 27/1, 29-42.

<sup>6</sup>Rufael, T., Catley, A., Bogale, A., Sahle, M. and Shiferaw, Y. (2008), Foot and mouth disease in the Borana pastoral system, southern Ethiopia and implications for livelihoods and international trade. *Tropical Animal Health and Production* 40/1, 29-38.

<sup>7</sup>Catley, A. (2004). Validation of participatory appraisal for use in animal health information systems in Africa. PhD thesis, University of Edinburgh.

<sup>8</sup>Bronsvort, B. M., C. de, V. N. Tanya, R. P. Kitching, C. Nfon, S. M. Hamman, and K. L. Morgan, 2003: Foot and mouth disease and livestock husbandry practices in the Adawa Province of Cameroon. *Tropical Animal Health and Production* 33, 491-507.