

# Para-veterinary professionals and the development of quality, self-sustaining community-based services

A. Catley<sup>(1)</sup>, T. Leyland<sup>(1)</sup>, J.C. Mariner<sup>(2)</sup>, D.M.O. Akabwai<sup>(1)</sup>,  
B. Admassu<sup>(1)</sup>, W. Asfaw<sup>(2)</sup>, G. Bekele<sup>(1)</sup> & H.Sh. Hassan<sup>(1)</sup>

(1) African Union/Interafrican Bureau for Animal Resources, P.O. Box 30786, 00100 Nairobi, Kenya

(2) RDP Livestock Services, P.O. Box 523, 3700 AM, Zeist, the Netherlands

## Summary

Livestock are a major asset for rural households throughout the developing world and are increasingly regarded as a means of reducing poverty. However, many rural areas are characterised by limited or no accessibility to veterinary services. Economic theory indicates that primary level services can be provided by para-veterinary professionals working as private operators and as an outreach component of veterinary clinics and pharmacies in small urban centres. Experience from the development of community-based animal health worker (CAHW) systems indicates that these workers can have a substantial impact on livestock morbidity and mortality through the treatment or prevention of a limited range of animal health problems. Factors for success include community involvement in the design and implementation of these systems, and involvement of the private sector to supply and supervise CAHWs. Examples of privatised and veterinary supervised CAHW networks are cited to show the considerable potential of this simple model to improve primary animal health services in marginalised areas. An analysis of constraints indicates that inappropriate policies and legislation are a major concern. By referring to the section on the evaluation of Veterinary Services in the OIE (World organisation for animal health) *Terrestrial Animal Health Code*, the paper proposes guidelines to assist governments in improving the regulation, quality, and co-ordination of privatised, veterinary supervised CAHW systems.

## Keywords

Community-based animal health worker – Developing country – Para-veterinary professional – Policy – Primary animal health service – Privatisation – Veterinary legislation.

## Introduction

For many years, para-veterinary professionals have played an important role in veterinary service delivery in developing countries (7, 8, 12, 23, 31, 91, 103). This broad group of workers comprises any type of animal health worker without a university veterinary degree, who may have received training varying from a few weeks duration to three years or more. This paper focuses on a category of para-veterinary professionals

referred to as community-based animal health workers (CAHWs), who often act as the frontline service providers in rural areas of developing countries.

Global overviews of CAHWs already exist (59, 61) and practical guidelines for the design and implementation of CAHW projects are also available (19, 64). However, the sustainability of many of these systems is questionable due to the limited involvement of the private sector and inappropriate policy and legal frameworks (97). The trend towards

privatisation of veterinary services reported in the mid 1990s (28, 82) is continuing, and the paper presents recent lessons from private veterinary facilities in rural areas employing CAHWs.

Considering the importance of veterinary privatisation in recent years, and the growing, albeit slowly, commitment to privatisation in developing countries, the paper focuses on sustainability issues related to the privatisation of veterinary services and the legal status of CAHWs. The economic rationale for the use of para-veterinary professionals and field evidence of the impact of CAHWs in poor, marginalized areas are also addressed. Finally, a certain number of recommendations are made to veterinary authorities for improving the regulation and co-ordination of CAHWs, and roles are suggested for statutory bodies involved in the registration of these workers.

## Why community-based animal health workers are appropriate

### The problem of physical access to livestock and high transaction costs in poorer, marginalized areas

The role of para-veterinary professionals in the delivery of animal health services has been the subject of discussion in international meetings for many years. One point of agreement has been the difficulties faced by veterinarians in physically accessing communities who may be hundreds of kilometres from the nearest urban centre and can only be reached by poor roads or on foot. Such conditions are commonplace in much of Africa, Asia and Latin America, and are particularly challenging during the rainy season or in areas affected by conflict.

An example of limited infrastructure in a developing region can be found in the Horn of Africa. Although this region has a similar human population density to the United States of America (USA), there are 50 times fewer roads and 100 times fewer paved roads per square kilometre (Table I). There are also 146 times fewer fixed line or mobile telephones and the region is characterised by civil war and major internal security problems. In addition to these constraints, 40% to 95% of the livestock population (depending on the country) is managed using pastoral or agro-pastoral production systems, which require the movement of herds through large areas of land that in general, have a far worse infrastructure than the region as a whole.

Veterinarians are unwilling to work in these areas for reasons of personal discomfort and insecurity, and economic analysis reveals that the high transaction costs related to business are not easily recovered, due to the relatively low monetary value of livestock in many rural communities (52, 62, 90).

**Table I**  
**People, land, infrastructure and communications: a comparison of the United States of America and the Horn of Africa (56)**

Indicator	United States of America	Horn of Africa
Human population	272.6 million	157.2 million
Geographical area	9.62 million km <sup>2</sup>	5.21 million km <sup>2</sup>
Population density	28.27/km <sup>2</sup>	30.17/km <sup>2</sup>
Total number of roads	1.50/km <sup>2</sup>	0.03/km <sup>2</sup>
Number of paved roads	0.41/km <sup>2</sup>	0.004/km <sup>2</sup>
Telephones/1,000 people	626	4.3

Regardless of the cash value of livestock, animals play a substantial role in the livelihoods of poor households. The use of livestock as a source of food, income, transport, hides and skins, draught power and manure is well documented, as are their numerous social and cultural functions (57). India accounts for approximately one sixth of the human population of the world and about 75% of these people live in rural areas. The majority of the people are small, marginal farmers and are often landless. Livestock holding is crucial for them – the poorest 60% of rural households own 65% of all milk animals, and in a largely vegetarian culture, dairy products are one of the few sources of animal protein (2). For these reasons, if appropriate primary level veterinary services become accessible rural communities in India and elsewhere will try to safeguard the health of their animals. As discussed later in this paper, CAHWs have far lower income expectations than veterinarians and will provide services by moving by bicycle, pack animal, canoe or on foot.

### Common livestock health problems, which can be handled by non-degree holders

As in industrialised countries, many animal health problems in developing countries are relatively easy to prevent or treat and can be handled by well-trained para-veterinary professionals (23, 59). Workers such as CAHWs may offer preventive or curative services for problems such as internal and external parasitism, respiratory diseases, footrot, mastitis, neonatal diseases and various other ailments. These workers can also vaccinate animals against anthrax, clostridial diseases and Newcastle disease, and offer castration, dehorning and similar services. To ensure that CAHW training is relevant, the disease problems in a particular area must be confirmed by a veterinarian at the design stage of a new project and dialogue with communities must lead to mutual agreement on the types of problems that the community-based worker should handle. The strategy for controlling each disease depends on various epidemiological factors and the availability and cost of different drugs and vaccines. For some problems, the solution is not to use pharmaceuticals but to change livestock management practices (32), e.g. by providing improved housing for poultry to prevent predation, or by modifying the harnesses of pack

animals to prevent sores. Again, the veterinarian is responsible for defining appropriate strategies for a given community and incorporating these strategies into the training of CAHWs.

### **The need to improve national disease surveillance systems**

The World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) has established risk analysis as the basis for the regulation of international trade. The Agreement has identified the OIE (World organisation for animal health) as the international body charged with drafting international standards for trade in animals and animal products, as the organisation responsible for facilitating the exchange of animal health information, and as a forum to co-ordinate trade risk analysis procedures. The overall goal is to enhance safety and equality of access to markets by increasing the objectivity and transparency of trade decision-making. The approach recognises science-based surveillance data as the basis of risk analysis (74).

In the developed world, the trend is to rely increasingly on statistically valid methods of laboratory-based surveillance. These methods call for large sample sizes, considerable infrastructure and significant investment, all of which are probably beyond the means of most developing countries. In developing countries with extensive, traditional production systems, the application of such methods appears inappropriate and unachievable. Over the last decade, numerous attempts have been made to implement animal health surveillance and information systems in these countries, based on conventional models developed for intensive, sedentary production systems common in the first world. Typically, these projects have proved to be unsustainable (68). Recently, the decline of government Veterinary Services in developing countries has been accompanied by reduced disease reporting, particularly from more remote rural areas. In some of these areas, disease reporting was virtually non-existent, even before recent downward trends in surveillance capacity.

The disparity between WTO requirements and the weak surveillance capacity of developing countries can be partly solved by better use of the CAHW networks already present. These workers are ideally placed to act as the 'eyes and ears' of a conventional surveillance programme and can greatly enhance the sensitivity of a system, particularly when other components are constrained. In a recent review of CAHW networks, performed with reference to the OIE guidelines for the evaluation of Veterinary Services, the use of such systems was found to offer scope for developing countries to improve services and surveillance in marginalised areas (56). According to the OIE *Terrestrial Animal Health Code* (the *Terrestrial Code*), 'Veterinary Services need to be able to show that despite communication difficulties they maintain reliable knowledge of the state of animal health' and are able to implement 'animal

disease control programmes' in a given zone. Veterinary-supervised community-based animal health delivery systems have proven to be useful for improving both disease surveillance and disease control in marginalized areas, and can contribute to animal identification, tracing, and animal movement control systems.

Some of the best examples supporting the use of CAHWs in disease surveillance can be found in Africa, with the eradication of rinderpest. In addition to delivering the bulk of rinderpest vaccination, CAHWs recognised and reported the last known foci of rinderpest in Karamoja, Uganda in 1994 (67), and contributed to the validation of rinderpest eradication in the Afar region of Ethiopia (1). In southern Sudan, field services are delivered by a network of over 1,000 CAHWs, who are also the main source of the clinical disease reports which are investigated by professional staff (98). Southern Sudan routinely carries out more stomatitis-enteritis outbreak investigations per year than any other area in the region. Twenty-three investigations were conducted in 2002 and seventeen in the first half of 2003 – all were negative (99). Thus, the community-based surveillance system in southern Sudan is one of the most active surveillance programmes in Africa.

In contrast to southern Sudan, an example of the use of CAHWs in a non-conflict situation can be found in northern Tanzania. In the Simanjiro, Monduli and Babati Districts, CAHWs provide monthly reports to government-employed livestock field officers (LFOs). The LFOs report to their respective district veterinary officers (DVOs) who in turn, report to the regional veterinary investigation centre (VIC). The CAHW reports are checked by the LFOs and a further level of control is possible by spot-visits to CAHWs by a veterinarian from the VIC. When this system was established on an experimental basis in 2002, there was a dramatic increase in the number of disease reports in three districts which were using CAHWs for disease surveillance, compared with two 'control' districts which were not. In the ten-month period from October 2002 to July 2003, in the Simanjiro, Monduli and Babati Districts, the mean number of disease cases reported per district, per month, was approximately 496. In the control districts of Hanang and Ngorongoro, this number was approximately 14.5 (96). This trial CAHW surveillance system was still being tested at the time of writing but provides strong evidence of the value of CAHWs in disease reporting. The validity of the CAHW reports in this trial is discussed more fully in the section 'Training issues and the technical competence of community-based animal health workers'.

Community-based animal health workers move with nomadic and transhumant pastoralists. They offer the opportunity to co-ordinate animal health surveillance and control across wide areas. They make unique contributions in border areas, across frontiers, and in areas of insecurity where activities of conventional service providers are often highly restricted or prohibited.

### Counteracting informal, poor quality services

Many rural areas of developing countries already possess various types of informal animal health service providers. These include market traders and small shops that sell veterinary medicines of variable quality and that have a limited capacity to advise buyers on correct usage. Medicines procured from these sources are commonly thought to be adulterated, expired or incorrectly stored. However, in the absence of alternatives, livestock keepers will buy and use whatever medicines are available. Field experience indicates that CAHWs improve service quality through better diagnosis and treatment of disease, and through the provision of advice to livestock keepers, as described in detail in the section 'Training issues and the technical competence of community-based animal health workers'.

## Types and roles of community-based animal health workers

### Community-based animal health workers

Many different types of CAHWs exist and some examples are provided in Table II. The functions of these workers vary, but in all the examples in Table II, the CAHWs were responsible for some curative treatments and most vaccinated livestock against certain diseases. In some projects, CAHWs also conduct disease surveillance and extension work. While nearly all projects train CAHWs to use modern veterinary medicines, the use of ethnoveterinary medicines is promoted in areas where veterinarians feel confident that these medicines are useful and can be handled by the para-veterinary professionals.

When veterinarians consider the various names for CAHWs, interpretation of the phrase 'community-based' is extremely heterogeneous. For some, the term simply refers to the location of the worker, i.e. that he/she is physically located in a community, regardless of their ethnicity or the process by which they were selected and deployed. In contrast, the authors consider that 'community-based' encompasses an entire process involving problem analysis, discussion of options for solving problems, selection and training of CAHWs, follow-up training, and community level monitoring and evaluation. At each stage of this process, participatory approaches and methods are used to facilitate discussion and to ensure the active involvement of communities in the project. When well implemented, the process gives the community clear responsibilities for identifying important animal health problems, selecting appropriate people for training as CAHWs, and adopting an appropriate system for the payment of services and the provision of financial incentives for para-veterinary workers. This interpretation of 'community-based' closely follows the principles of community participation in

development, and has important consequences regarding the financial and social sustainability of CAHWs (54). The approach differs markedly from the system of 'vetscouts' or other types of primary level workers used by Veterinary Services in the colonial and post-colonial eras (18, 59). These systems might have been labelled 'community-based', but were designed and implemented with limited community involvement and tended to suffer numerous, often critical, problems. Before the emergence of community participation as a mainstream component of development, some CAHW-type projects were already working in ways that would later become known as 'community-based' (11, 12).

A clear and common understanding of terminology can assist Veterinary Services in improving the quality and sustainability of CAHW systems. If a participatory approach to the establishment of a CAHW system is adopted, various stages relating to the design and implementation of the system should be followed and described in national-level guidelines. Furthermore, a common limitation of many CAHW projects, implemented either by government or non-governmental organisations [NGOs], is a focus on training as the final target instead of the development of an overall system for the supply, supervision and evaluation of CAHWs.

### Disease-specific community-based programmes

In addition to those CAHW projects which target a number of different animal health problems, at least two other types of animal health training programmes exist at community level. These programmes include specific disease or vector control initiatives, such as community-based tsetse (10) or rabies control (29). In these cases, local people are trained to maintain tsetse targets or traps and follow-up suspected rabies cases.

### Mass training programmes

Another example of a community-level approach is mass training of livestock keepers in basic livestock health and husbandry. This approach has the advantage that many people receive new information. In eastern Chad, a mass training project was used for a specific type of transhumance involving extensive movement of camels and cattle, and was based on an understanding that CAHWs in Chad were unlikely to meet the needs of these particular groups (64). In Maritime Guinea, mass training was used when implementation of a CAHW approach appeared to be premature in relation to arrangements for the supply of CAHWs and legislative issues at that time. Clearly, for livestock keepers to act on information provided during mass training, they require access to some form of veterinary service and, as noted in Guinea, mass training is difficult to evaluate (97). Few studies have been conducted to demonstrate whether mass training affects the way livestock keepers prevent or treat animal diseases.

**Table II**  
**Examples of names, tasks and duration of training for community-based veterinary workers \***

Name	Project and country	Tasks and duration of training
Barefoot Veterinary Technician	Action for Food Production, India (5)	Deworming, vaccination, first aid and use of ethnoveterinary medicine. Trained for twenty days plus refresher training
Village Animal Health Worker	Animal Health Improvement Training Programme, United Mission to Nepal, Nepal (85, 92)	Various curative and preventive services, including use of anthelmintics, antibiotics, acaricides and vaccines. Trained for two weeks with four- to five-day refresher courses
Basic Veterinary Worker	Dutch Committee for Afghanistan, Afghanistan (83)	Focus on vaccination campaigns and the use of anthelmintics; some curative treatments. Trained for one month
Veterinary Livestock Specialist; Village Poultry Specialist	Aga Khan Rural Support Programme, Pakistan (9)	Focus on preventive measures, particularly vaccination and extension; disease surveillance. Village Livestock Specialists are mainly men, whereas Village Poultry Specialists are all women. Trained for three to four weeks
Village Livestock Promoter	VETAID, Mozambique (70)	Prevention and treatment including use of antibiotics, anti-protozoals, anthelmintics and acaricides; organisation of Newcastle disease vaccination, extension advice on nutrition and reproduction, disease surveillance. Trained for three weeks
Veterinary Auxiliary	Vétérinaires sans frontières, Senegal (97)	Vaccination of poultry, small ruminants and cattle; use of anthelmintics, trypanocides and other drugs. Trained for twenty-three days in four separate courses
Community Livestock Auxiliary	Various, Zambia (44)	Use of anthelmintics, acaricides, long-acting oxytetracycline and non-prescription medicines; castration, hoof trimming, dehorning; disease surveillance. Trained for two to four weeks
Community-based Animal Health Worker	Pan African Rinderpest Campaign, Ethiopia (4)	Prevention and treatment of helminthiasis, fascioliasis, tick infestation, trypanosomiasis, miscellaneous infections; use of heat-stable rinderpest vaccine; disease surveillance. Trained for ten days plus refresher training
Promoteurs d'élevage	Vétérinaires sans frontières, Guatemala (77)	Basic preventive and curative measures, including vaccination. Initial basic training of four weeks followed by additional training periods of three to sixteen days
Village Keyman	German Agency for Technical Co-operation, Malawi (44)	Focus on worm and tick control; vaccination against Newcastle disease and blackquarter. Trained for four days

\* Within a particular country, the names, tasks and duration of training of community-based veterinary workers often vary. The need for the harmonisation and co-ordination of this level of worker is discussed in the paper

## Impact of community-based animal health workers

Numerous studies have been conducted on the impact of CAHWs, and examples from Africa are provided in Table III. In addition to these studies, CAHWs in Afghanistan were found to reduce mortality by 5% in calves, 10% in lambs and 38% in kids compared with control areas without para-veterinary staff. The cost of this programme was US\$25,000 per district, but the benefit to farmers was estimated to be US\$120,000 per district, per annum (83). In the Philippines, 93% of farmers with access to CAHWs used worm control and 40% used vaccination, but of those farmers who did not have access to para-veterinary

professionals only 45% used worm control and 0.3% used vaccination (60). Disease morbidity in small stock was approximately 50% lower in villages with CAHWs, and in these areas, 71% of farmers preferred to call on these professionals rather than other service providers.

The introduction of CAHWs also had a substantial impact in Indonesia (50). Before the introduction of CAHWs, 40% of the requests of livestock keepers for assistance from government service providers required more than three days to be addressed and only 16% of users rated the service as 'good' or 'very good'. After CAHWs were introduced, 75% of requests received a response within 30 minutes and 78% of users rated the service as 'good' or 'very good'.

**Table III**  
**Examples of the impact of Community-based Animal Health Workers (CAHWs) in Africa**

Agency, country	Impact
Oxfam UK/Ireland, Kenya	In the Wajir District, a drought prone pastoral district in North-East Kenya, CAHWs reduced annual mortality in camels, cattle, sheep and goats by 31%, 32% and 25% respectively, compared with annual mortality of 20%, 17% and 18% in areas without CAHWs. The reduced loss of livestock was valued at approximately US\$350 for each household in the project area and this sum was sufficient to buy grain to feed two adults and four children for 250 days (73)
Intermediate Technology Development Group, Kenya	In Kathekani, CAHWs were assessed four years after training. Farmers in villages without CAHWs reported 70% more cattle deaths and 200% more sheep and goat deaths compared to farmers with access to CAHWs, and they were twice as likely to sell animals prematurely due to disease (35). The area was revisited five years later and these benefits were still being delivered (60). Due to community perception that CAHWs reduced the risk of livestock losses, by 2003, 90% of households with access to CAHWs reared livestock, compared with 70% of households without access to CAHWs. This benefit was particularly evident in households in the poorest quartile in the two samples. The poorest households without access to CAHWs reared no ruminants, whereas 64% of the poorest households with access to CAHWs reared at least one ruminant
VETAID, Tanzania	Established in 1998, a CAHW project in the Ruvu Remit division, Simanjiro District, was assessed in May 2001. The use of interviews and participatory methods showed how Maasai pastoralists associated the CAHW service with reductions in calf mortality of between 59% and 93%. This led to an increase in the size of milking herds and more cows milked per household. For example, the average number of cows milked per household increased from 5.3 to 24.2 cows. Communities concluded that the increased milk availability had a significant impact on local food security (72)
FARM-Africa, Tanzania	Established in 1995, a CAHW project was assessed in 2002. In areas with and without CAHWs, cattle mortality was 9% and 15% respectively, and small ruminant mortality was 17% and 25%, respectively (60)
Pan African Rinderpest Campaign, Ethiopia	In 1994, the Pan African Rinderpest Campaign (PARC) in Ethiopia trained twenty CAHWs in the Afar region and supplied them with heat-stable rinderpest vaccine. Prior to this activity, conventional, government vaccination campaigns had vaccinated around 20,000 cattle per year in the region and achieved approximately 60% immunity. In 1994-1995, the twenty newly-trained CAHWs vaccinated 73,000 cattle and achieved 83% immunity. No outbreaks of rinderpest were reported from the Afar region after November 1995 (65)
Save the Children USA, Ethiopia	The Dollo Bay and Dollo Ado woredas (districts) are located in the far south of Ethiopia and border Kenya and Somalia. In 2002, an impact assessment of CAHWs in these woredas was conducted by a team of veterinarians from various government agencies and non-governmental organisations (NGOs). Statistically significant reductions in mortality were reported in camels, cattle and small ruminants for those diseases that CAHWs were trained and equipped to treat, versus those diseases that they were not trained to treat (76)
Operation Lifeline Sudan, Sudan	In southern Sudan, community-based rinderpest control has formed the basis for animal health service delivery since 1993. Using a network of NGOs to work with communities to train and support CAHWs, the United Nations Children's Fund (UNICEF)-Operation Lifeline Sudan (Southern Sector) Livestock Programme achieved a 10.6 fold increase in vaccination coverage following the introduction of community-based systems. Since 1993, vaccination coverage has been maintained at more than 1 million cattle vaccinated/year and reported outbreaks of rinderpest in southern Sudan decreased from fourteen outbreaks in 1994 to one outbreak in 1997 (45)

UK: United Kingdom

USA: United States of America

Most evidence of the impact of CAHWs is derived from cross-sectional studies rather than from data from project monitoring records. This reflects the poor monitoring of many CAHW projects and indicates a need for better commitment to monitoring by governmental and non-governmental agencies (19). In addition, an understanding of impact needs to take account of the very varied picture with regards the context in which different projects are established – projects are often implemented with donor support and framed as relief, rehabilitation or development programmes. The objectives of these programmes vary considerably, as do the indicators for defining their success.

Regarding the impact of CAHWs on disease reporting, experiences from Pakistan (9) and Ethiopia, Uganda and southern Sudan (68) indicate that these para-veterinary workers do indeed act as frontline reporters of epizootic disease outbreaks in remote areas. In central Somalia, the German Agency for Technical Co-operation, a development agency

owned by the German government (*Deutsche Gesellschaft für Technische Zusammenarbeit*), assessed the use of CAHWs in a surveillance system for contagious caprine pleuropneumonia and concluded that the disease reports of the workers were reliable (11).

## Experiences with private community-based animal health workers

### Community-based animal health workers in veterinary supervised, private businesses

For many farm animal veterinary practices in industrialised countries, it is principally drug sale volumes, rather than actual

clinical work, that determine profitability, and the same is true of emerging veterinary clinics or pharmacies in rural areas of developing countries. However, while a veterinarian in an industrialised country can use a vehicle to maintain contact with clients and distribute drugs, a veterinarian in a remote area of a developing country is unlikely to be able to afford a vehicle and will depend on over-the-counter sales. In this situation, any mechanism that increases drug distribution should be considered as a means to improve business viability. For this reason, privatised networks of CAHWs, supplied and supervised by private professionals, have been proposed as a means to improve the delivery of veterinary services in pastoral areas of East Africa (55) and West Africa (21, 58).

Conventional small business planning methods can be useful tools for predicting the viability of private veterinary clinics or pharmacies in marginalized areas. For example, during a business planning training course in the Somali region of Ethiopia, veterinarians were asked to formulate hypothetical business plans for professionally managed pharmacies 'with' and 'without' CAHWs, and comment on the likely success of each option. This approach clearly showed that networks of between twenty-five and thirty-five CAHWs significantly improved the financial performance of a business, mainly due to an increased turnover of drugs (Fig. 1).



**Fig. 1**  
As the business performance of private veterinary pharmacies and clinics is highly dependant on drug turnover, community-based animal health workers can improve business viability by providing services in remote areas

*Photo courtesy: M. Wadleigh and C. Huggins*

In Senegal, the increasing presence of private veterinarians in the pastoral zone of Linguère led to the emergence of supportive links between these veterinarians and CAHWs, which clearly fitted economic theory (58). A survey conducted in 2000 showed that 90% of CAHWs interviewed worked with a private veterinarian and 87% reported that veterinarians were

not their competitors. In North-West Kenya, a private veterinarian has established a private practice that uses animal health assistants (AHAs), who in turn, supervise and supply a network of CAHWs in areas inhabited by Pokot pastoralists (78). The location of the practice enables the delivery of services to both Pokot pastoralist communities and sedentary farmers in midland areas. Despite the willingness of some veterinarians to work in more remote areas, many do not originate from pastoralist or other marginalized communities and avoid working in communities of different ethnicities and cultures. A general trend is that regardless of the livestock economy of an area and the capacity of the area to support a private practitioner, veterinarians prefer not to live in pastoral areas.

Studies in Kenya have highlighted the value of private, basic animal health services which use an AHA to provide day-to-day support to CAHWs. In Kenya, AHAs receive two to three years training at government institutes and appear to be far more willing and able to establish small veterinary pharmacies in areas where veterinarians do not wish to work. Research conducted in 2001 compared different models of private animal health service delivery in six districts with large pastoralist populations, and the findings are summarised in Appendix 1 (75).

In a private AHA-CAHW system, a government DVO is responsible for regulation and quality control. The findings of the 2001 study were supported by research in the Mwingi District of Kenya in 2002, which assessed the performance of CAHWs who were supplied and supervised by AHAs who ran private pharmacies as well as being employed by the government (80). The overall system was overseen by the DVO. At the time of the study, the system had been operating for more than three years without any external assistance and was judged according to financial indicators, the technical competence of the CAHWs and farmer perceptions of these workers relative to other service providers. Farmers consistently ranked CAHWs higher than other types of service in terms of three main indicators, i.e. affordability, accessibility and the outcome of treatments. In addition, a clear, mutually beneficial arrangement existed between the CAHWs and AHAs. The likelihood of treatment being successful was found to be increased by the proximity of CAHWs to the community.

Further evidence of the importance of privatised, higher-level para-veterinary professionals linked to CAHWs is available from Ethiopia. In the Somali region, a joint project of the Regional Bureau of Agriculture and Save the Children United Kingdom (UK) (an NGO) provided training in business planning and established a credit facility in collaboration with the Commercial Bank of Ethiopia (17). Evidently, although the licences for some of the businesses had been issued to veterinarians, veterinary assistants were usually responsible for the routine management of the pharmacies and for communicating with clients (13). Much like the AHAs in Kenya, veterinary assistants in Ethiopia are para-veterinary

professionals with at least two years training. Another finding from this project was that in the absence of external support, AHAs were meeting communities to establish sub-agents at community level. In some communities these sub-agents were CAHWs who had been trained by the government or NGOs. In other communities, the AHAs and the community in question identified a person to act as a sub-agent. Therefore, the AHAs recognised the value of working with community-level operators and were able to arrange systems or supply and remuneration that were mutually beneficial. In East Africa, this simple AHA-CAHW model appears to be the most financially viable privatised system for the delivery of primary animal healthcare in areas that may not support a private veterinarian. However, an important component of the system is that it is supervised by a government veterinary officer.

### **Community-based animal health workers and livestock user associations**

Livestock user associations (LUAs) are formed when a community, or a group of farmers with similar problems, organise themselves in an effort to improve their ability to access resources or services, or to lobby for policy change. The formation of LUAs is sometimes encouraged and supported by government, but more often by NGOs. With recent increased interest in 'millennium goals' and the need to reduce poverty levels globally, development organisations and relevant government ministries commonly encourage LUAs in resource poor and under-served communities. The principal idea behind LUAs is that collective action and the pooling of resources, ideas and commitment is more likely to yield results than individuals working alone. For politically marginalized groups such as pastoralists, well-established LUAs offer an effective mechanism for lobbying for government support and policy change. In many cases, LUAs also try to address a range of livestock-related concerns including animal health, access to water, range management and marketing. Livestock user associations are non-profit making and membership requires the payment of a nominal fee and is normally open to anyone from a defined geographical area or a particular farming system.

The performance of LUAs is highly variable. Successful examples include the work of Operation Flood, an initiative of the National Dairy Development Board of India, which was established in 1970 with the aim of increasing milk production in the country (a 'flood' of milk) and augmenting rural incomes while maintaining a fair price for consumers. The dairy co-operatives of Operation Flood used levies on the successful collection and bulk marketing of milk to provide veterinary services to members (25). In the Central African Republic, the National Federation of Central African Livestock Owners (FNEC) supplied drugs and vaccines directly to a large number of producers and 60% of all herders were members (24, 91). Although successful during its early years, the FNEC later suffered from government intervention and is currently

providing few, if any, services. Although in the industrialised world there are examples of successful farmer organisations working in the animal health sector (i.e. *Groupements de défense sanitaire* [Animal Health Groups] in France, [15]), numerous case studies describe the failure of LUAs in developing countries (26, 34, 95). Reviews of experiences in West Africa are particularly critical of the use of LUAs by governments as a means to implement policy at local level, rather than developing strong civil society groups that represent the interests of, and act as advocates for, livestock keepers (14, 34, 86).

In theory, LUAs have certain characteristics that should enable them to support CAHW delivery systems and as a group, derive benefits from improved animal health, as follows:

- increased purchasing power and therefore, access to cheaper veterinary drugs and equipment or infrastructure, e.g. spray race and dips
- loyalty from members, who will purchase veterinary services from the LUA rather than elsewhere
- ability to access government grants or donor funds as a non-profit organisation
- mobilisation of members for vaccination campaigns and strategic prophylactic treatments, e.g. community-wide deworming
- access to technical information and extension advice for members
- ability to set minimum standards and guidelines for members and services, e.g. a minimum level of training for CAHWs, the quality of traps for tsetse control
- use of profits from the provision of particular services, e.g. veterinary services, to invest in water or marketing infrastructures for LUA members.

From the perspective of veterinary regulations, LUAs are usually licensed (in order to obtain a bank account). Therefore, in developing countries where veterinary regulations are poorly enforced, LUAs offer a mechanism for governments to enforce minimum standards for the delivery of veterinary services. Whilst these advantages are real, LUAs are also subject to important constraints, as follows:

- clinical services constitute a private benefit and LUAs must therefore overcome the fundamental mismatch between collective responsibility and the delivery of a private service
- organisational and management problems are common in LUAs, and they often require considerable, long term capacity-building support from external agencies; poor financial management and low personal incentives and commitment are often reported and management capacity declines when external support is withdrawn

– the membership and decisions of LUAs can be dominated by urban-based elites, with exclusion of less wealthy livestock keepers

– a potential lack of focus due the integrated approach, e.g. animal health, marketing and access to water.

To comply with the principles of the *Terrestrial Code*, CAHWs should work under the supervision of a veterinarian. This poses a problem for those LUAs that supply CAHWs directly from their own drug stores, as these are often managed by non-veterinary trained personnel. Although these arrangements are financially viable, the CAHWs are supervised by unqualified people. It is possible that larger LUAs could employ an AHA or veterinarian responsible for supervising CAHWs, but this may not be affordable for smaller LUAs. Developing LUAs to a level where they have the capacity to sub-contract veterinarians or AHAs is complicated and time-consuming, and, as a result, it rarely happens.

A further constraint on the employment of veterinarians or para-veterinary professionals by LUAs is disease reporting. For efficient surveillance, Veterinary Services need to make good use of private sector operators in remote areas, and create incentives for timely reporting of disease events (e.g. by sub-contracting). However, the relatively wealthy livestock keepers and traders who control LUAs may discourage the reporting of disease outbreaks by their veterinary staff because this could lead to movement controls or other interventions that are perceived to be restrictive. In these situations, the veterinary worker has to choose between the ethical responsibility to report and the instruction from an employer not to report. This contrasts with a direct contract between governments and private veterinarians or AHAs, in which the ethical and financial incentives for reporting are mutually supportive.

Livestock user associations play a vital role in advocacy and the organisation of resources. The LUAs that have achieved sustained success for their members have usually been in operation for over a decade (48, 95), and many have received specialist facilitation and capacity-building support from NGOs and government organisations. Considering that this level of support is costly and has to be maintained over many years, the authors believe that LUAs are not a practical solution to veterinary service delivery in countries with limited resources. Many countries have no history of successful farmer organisations or co-operatives and may therefore reject further initiatives in this direction due to past failures. In these countries, a more pragmatic approach to primary veterinary service delivery would be for governments to enable private veterinarians and para-veterinary professionals to provide the clinical services that livestock owners are requesting and willing to pay for.

## Constraints on the sustainability of quality, privatised community-based animal health workers

### **Lack of legal support for veterinary-supervised community-based animal health worker networks**

Although further research is required on the economic performance and viability of private veterinary clinics and pharmacies in marginalized areas, the presence of a CAHW network is essential to ensure sufficient turnover of drugs and business survival in some areas. However, many workers have noted the lack of supportive legislation for CAHWs (36, 46, 61, 97). Although an increasing number of countries are attempting to promote veterinary privatisation, a private veterinarian wishing to use CAHWs faces a situation in which a determining factor of business success, i.e. a CAHW network, is illegal. Therefore, legislative reform to support privatised, veterinary-supervised CAHWs should be a priority in those countries wishing to improve basic services in marginalized areas. Such reform will need to take account of the role of higher-level para-veterinary professionals in areas where it is clear that veterinarians are unlikely to establish private businesses. In these areas, government veterinary officers will be needed to supervise private delivery systems.

Even in those countries where CAHWs receive official endorsement, their activities and impact can be limited because they are only allowed to use certain types of medicines (36). For example, CAHWs in highland Ethiopia are permitted to use drugs for internal and external parasites, but are not allowed to use injections (1). Consequently, preventable diseases such as anthrax or blackleg are still major problems for farmers, who are highly dependent on oxen for ploughing. Furthermore, these vaccines are inexpensive and farmers are willing to pay (38). Paradoxically, this is a country where, in lowland areas, some of the most efficient rinderpest vaccination coverage ever recorded can be attributed to CAHWs (65). In other countries such as Bangladesh (27) and Pakistan (9), CAHWs focus more on vaccination than treatment. In part, restrictions on CAHWs arise because veterinarians assume they are incapable of conducting certain tasks. However, as various countries limit CAHW activities in different ways, the mechanism for defining the tasks of these para-veterinary workers appears to be highly subjective and not based on field experience. In addition, continuing government control of preventive and curative services in some countries influences the way in which tasks are delegated to CAHWs. As the privatisation process continues, CAHW roles should become more aligned with the demands of livestock keepers.

In Africa, Asia and Latin America the subject of the legal recognition of CAHWs has often provoked heated debate (21, 30, 61, 71, 84, 102). In general, veterinarians with field experience of training and working with para-veterinary staff in remote rural areas are 'pro-CAHW', while veterinarians in senior positions in government, veterinary boards, veterinary associations and academia are 'anti-CAHW'. Some of the common concerns of opponents to CAHWs are discussed below.

### Training issues and the technical competence of community-based animal health workers

For many veterinarians who make or influence policy, the ability of CAHWs to correctly diagnose diseases and administer drugs is a key issue. In part, these concerns relate to the short duration of training of these workers and in some areas, the use of illiterate CAHWs. Justifiably, policy makers need to feel confident that the use of CAHWs will not lead to drug resistance or food safety problems.

Regarding the training of CAHWs, short, practical training followed by refresher courses can produce para-veterinary staff of sufficient technical competence. Reviews of training approaches and training manuals commonly recommend the use of participative methods based on the principles of adult learning (43, 59, 61, 89) and numerous area-specific training manuals are available (47, 92, 93, 94, 100). In summary, this type of training uses the existing knowledge of trainees as the basis for learning and focuses principally on problem solving and practical tasks. The training is usually conducted in the communities that the CAHWs will serve and at a time that is convenient for them (42, 88). This approach is similar to the participative training of basic human health workers that has been used for over twenty years (101). An important determinant of success is that the veterinarians who train CAHWs must themselves have been trained in participative training techniques (43).

Table II shows that substantial benefits can result from the use of CAHWs. Although professional veterinary associations and other bodies often express concerns that CAHWs encourage drug resistance by misusing antibiotics and other drugs, recent research conducted in various countries indicates that this is not the case. In Mozambique and Ghana, farmers used antimicrobials routinely, but with limited knowledge on correct usage and often from black-market suppliers. In the absence of a CAHW, most farmers cited the local, untrained drug seller as their main source of advice (22). When CAHWs were present, over 70% of livestock keepers ranked them as their preferred source of animal health advice, and assessment of these para-veterinary workers indicated that they gave good advice. Despite their greater knowledge, veterinarians did not rank highly as sources of advice as they were simply geographically too far away.

In Kenya, the Kenya Veterinary Association helped to devise an assessment of CAHWs in the Mwingi District and tested their knowledge of disease diagnosis, use of veterinary medicines, knowledge of zoonoses and reporting procedures (80). Random sampling of forty CAHWs from a total of ninety-nine workers in the district, produced a 90% pass rate. In the Lake Zone of Tanzania, assessment of the technical competence of thirty-six CAHWs by a team that included veterinarians, concluded that thirty-four (94%) were of a sufficient standard and able to correctly calculate drug dosages (63). Also in Tanzania, the diagnostic skills of CAHWs were tested to determine their value in a disease surveillance system (96). Of 236 diagnoses made by CAHWs and assessed by a veterinary investigation officer, the diagnoses of the para-veterinary staff were rated as 'very good' (47%), 'good' (41%), 'fair' (11%) and 'poor' (1%) (Fig. 2).



**Fig. 2**  
**Emphasis on practical training and close supervision of trainees helps to ensure that community-based animal health workers are technically competent**

*Photo courtesy: ANTHRA, India*

Many reviews of CAHW projects note the importance of supervision based on functional links with higher levels of veterinary workers. Such links are important for ensuring the continuation of best practice with regards drug usage and ensuring that CAHWs are informed about new products as they appear on the market. Higher-level para-veterinary professionals or veterinarians can also provide a referral service and this relationship helps to prevent misdiagnoses and incorrect drug usage (87). In a survey in Senegal, 43% of CAHWs referred cases to a supervising veterinarian (58) and in Kenya, 50% of CAHWs viewed AHAs as advisers and trainers to whom they referred difficult cases and who supervised their work (80).

Despite increasing evidence showing that para-veterinary professionals such as CAHWs can provide affordable, primary level services that can strengthen and expand the businesses of private veterinarians, groups such as professional associations and academics still cite competition as a reason for maintaining the illegitimate status of CAHWs (Fig. 3).



**Fig. 3**  
**Monitoring of a community-based animal health worker (CAHW) in the Afar region of Ethiopia includes assessment of the CAHW and inspection of drugs and equipment by a veterinarian**

*Photo courtesy: Ch. Hopkins and A. Short*

Some countries have developed national guidelines for training CAHWs. In Kenya and Ethiopia the formulation of national guidelines was based on consultation between the veterinary statutory bodies, veterinary services and NGOs, with the latter providing the practical experience. These guidelines propose the use of participative training methods and include a standardised curriculum (47, 69). Although standardised (the curriculum comprises a mandatory component that every CAHW is required to learn), it also includes a location-specific component that allows flexibility according to the disease situation in different livestock production systems.

However, the development of a national curriculum and training guidelines is not always straightforward. In Nepal, CAHWs were trained by the government and NGOs, and a national skills test was developed (39). The government training lasted thirty-five days whereas that of the NGOs was only two weeks (85). Although a greater proportion of NGO trainees passed the skills test relative to government trainees, the government still insisted that the thirty-five-day training course should be mandatory. This reflects a common perception among policy-makers that training quality depends on the duration of training, rather than the training approach. In the case of Nepal, nationwide application of the thirty-five-day training would result in training costs that far exceed the investment needed to achieve the required level of training of these workers.

### Selection of community-based animal health workers

Practical guidelines for the selection of CAHW trainees highlight the need for communities to identify selection criteria, and have a major role in selecting people for training (32). Typically, CAHWs are part-time workers who live in communities and keep their own animals. In pastoral systems, CAHWs move with the herds during seasonal migrations.

Examples of selection criteria used in different CAHW-type projects are provided in Appendix 2.

A common point of disagreement between field veterinarians and policy-makers is the need for CAHWs to be literate. Field experience indicates that literacy is not a determinant of CAHW performance and that communities rate the non-technical and social qualities of CAHWs more highly. In Kenya, these findings were confirmed by research on the 'ideal qualities' of CAHWs, as perceived by livestock keepers (in three districts) and policy-makers (79). Livestock keepers prioritised the qualities 'trustworthiness', 'commitment' and 'responsibility', whereas policy-makers felt that the most important qualities of CAHWs were 'literacy', 'level of training' and 'ethnicity'. This research demonstrated the importance of community involvement in CAHW selection, because only community members are well placed to judge the social qualities of potential CAHWs. Therefore, procedures for ensuring community involvement in the selection of these workers should be included in national guidelines on CAHW systems.

### Use of existing, legalised para-veterinary professionals

In some developing countries, structural adjustment resulted in a dramatic downsizing of the veterinary staff employed by governments. In these countries, statutory bodies and veterinary associations often argue that CAHWs should not be promoted because there are large numbers of trained (but unemployed) former government para-veterinary professionals who can provide services. However, these arguments are rarely supported by an assessment of the economic viability of large numbers of retrenched workers being absorbed into the private sector. Furthermore, CAHWs are usually part-time workers who also make a living from rearing livestock. Their expectations with regards to financial incentives are usually low compared with AHAs, particularly in a private sector market. Community-based animal health workers also live within their communities. In pastoral areas, they move when herds move and therefore, can provide an immediate service. This differs from a sedentary, urban-based AHA who in the event of a disease problem, has to be located and then transported to the community. For these reasons, when requested to select someone for training, communities rarely choose (or even mention) unemployed AHAs.

### Using new legislation as a flexible, enabling tool

For many government and academic stakeholders, the idea of legislating in support of CAHWs instils considerable fear and concern. In addition to more obvious vested interests and a desire to maintain the monopoly of the veterinary profession on service delivery, belief that legislation is 'fixed in stone' and once altered, cannot easily be changed, is widespread. While the process of legislative reform can appear long and daunting, an understanding of legal structure can lead to new laws on CAHW status and roles that can be amended relatively rapidly.

A crucial aspect of supportive legislation for CAHWs is the positioning of specific information concerning these workers. Whereas principal legislation is passed by parliament and concerns acts and ordinances, subsidiary legislation can be changed by a minister on the advice of a veterinary statutory body. With this in mind, a general cadre called 'para-veterinary professionals' should fall under principal legislation, but the specific types, roles and supervision of these various para-veterinary professionals, including CAHWs, should be defined under subsidiary legislation (81).

### **Continuing support to subsidised systems for veterinary drug supply**

At policy level, an important constraint on privatised, basic veterinary services has been the perception that poor people cannot pay. Although work in Kenya over fifteen years ago showed the benefits of the commercialisation of veterinary services for poorer users (51), the belief that 'people cannot pay' still prevails (20). A review of NGO projects in the early 1990s noted that livestock keepers embraced cost recovery enthusiastically (103) and community dialogue in remote pastoral areas of Uganda, Ethiopia and Somalia has shown how marginalized communities can calculate the cost-benefit of treating sick livestock (20). The growing number of private veterinary clinics and pharmacies linked to CAHWs in more remote areas is an indication that when livestock keepers have access to services based on trained personnel and quality drugs, they pay for those services (13, 78).

When considering willingness and ability to pay, an important factor to be taken into account is the ability of people to turn livestock or livestock products into cash. Consequently, an often-used argument is that privatisation of veterinary services should occur in parallel with livestock marketing initiatives. However, CAHWs are also evidently better able to deal with debts and in-kind payments for their services compared with higher levels of animal health workers (80).

When considering the potential for private veterinary services to reach the poorest livestock keepers, it is worth noting that subsidised government services rarely benefit the poor. Subsidised systems are often characterised by small quantities of drugs rapidly purchased by users in close proximity to the source. These users tend to be more urban-based, wealthier people. The general experience of the authors is that government service providers tend to increase the official price of 'subsidised' services to a level that falls slightly below a commercial rate. This enables them to effectively undercut the private sector while also making a substantial profit. These findings are similar to those in India which showed that the price for attendance of cases by government workers far

exceeded the official price, but fell just below the charges of private veterinarians (2).

Contingent valuation has been used in various studies to predict the willingness of different wealth groups to pay for basic veterinary care. The method requires livestock keepers to express their willingness to support various, costed scenarios that are proposed by the researchers. In western Tanzania results showed that while all wealth groups were willing to pay for CAHWs, those livestock keepers with more cattle were less inclined to pay (37). This inverse relationship between livestock holding and willingness to pay reflects the relative importance of livestock losses in large, compared with small, herds. For a farmer with 100 cattle, the loss of a cow represents only 1% of his herd and is easily absorbed. For a farmer with only one cow, the loss of that cow could be catastrophic. Contingent valuation was also used to assess willingness to pay in the States of Kerala, Gujarat and Rajasthan in India. In Gujarat, wealthy households were willing to pay about 68% more than poorer households, although the latter were still willing to pay 680.00 Indian rupees (approximately US\$15.00) per year for veterinary services. There was no significant difference in willingness to pay between richer and poorer households in the States of Rajasthan and Kerala (2). Even in Orissa, the poorest State in India, the willingness to pay was positive (3).

In northern Somalia, discussions with the poorest pastoralists indicated their willingness to pay for basic services (16) and in the highlands of Ethiopia, an impact assessment of a government-run CAHW project concluded that poorer farmers were paying for services; the main difficulty was the limited supply of medicines rather than the cost (38). Recent research in Kenya, Tanzania and the Philippines assessed the impact of CAHWs on rich and poor households and concluded that these para-veterinary workers were valuable for protecting the livestock assets of poor families (60).

These findings show that when centrally-located policy-makers discuss the potential for privatised veterinary services, assumptions about the willingness and ability of poor livestock keepers to pay for services in so-called 'low potential' areas should be avoided. If people are consulted and given the choice of a government service that is subsidised (but often inaccessible or unavailable), or a more expensive private service that actually addresses their principal veterinary needs, they usually select the latter.

Despite these findings, projects using CAHWs are often established by either governments or NGOs using subsidised systems for the supply and sale of veterinary drugs. Typically, these projects use some form of revolving fund in which revenue from drug sales is supposed to cover the cost of re-supply. Levels of subsidy vary but even when drugs are sold at cost price or more, the project usually has hidden subsidies in

the form of transportation and administration costs. The problems of government-managed revolving funds have been known for many years (23) and examples of poor performance in relation to CAHW systems are available (20, 49). In NGO projects, a wide variety of cost recovery systems have been attempted, but these projects often collapse when external support is withdrawn (20). Projects that depend on systems other than fully privatised supply of veterinary products are characterised by confusion over pricing and incentives for CAHWs (33, 41, 66), insufficient volumes of drugs and movement of drugs out of the project area by traders (20). These projects also reinforce attitudes of dependency on government or aid projects. Of these problems, it is insufficient drug supply that often cripples CAHW systems (Appendix 3).

### **Weak commitment to sub-contracting public sector tasks**

For private veterinarians, particularly those working in more marginalized areas, contracts from government are viewed as an important source of income (88). Early reports from a private veterinarian practice in Salamat, a remote region in eastern Chad, demonstrated the importance of a government contract for rinderpest vaccination (65). This practice comprised one veterinarian, two veterinary assistants and a CAHW network. Profit projections for the practice clearly showed the importance of the rinderpest contract for the overall performance of the business.

In some areas, in the absence of government contracts, a private veterinarian is less likely to run a profitable business. At the same time, government Veterinary Services continue to implement a variety of disease control tasks that could be sub-contracted. When combined with the absence of supportive legal frameworks for CAHWs, the failure of government commitment to sub-contracting is a serious constraint to the privatisation of veterinary services in remote areas (53). This situation is now highly relevant because as previously explained, Veterinary Services are required to demonstrate that national disease surveillance systems are functioning throughout a country according to the OIE *Terrestrial Code*.

### **Poor co-ordination and quality control**

In some developing countries, the emergence of quality, veterinary-supervised CAHW systems has been hampered by the inability of governments to co-ordinate the numerous governmental and non-government bodies that are involved. In countries where large numbers of NGOs operate, diverse approaches to the design and implementation of CAHW projects can exist (21). It is important to acknowledge that much of the early testing of CAHW-type approaches took place in the NGO sector, as did the development of participatory

approaches to project design and evaluation and CAHW training. In addition, some NGOs work directly with governments with a view to influencing policy. However, NGOs with this expertise are often outnumbered by a myriad of other organisations with limited experience of animal healthcare. Even within veterinary specialised NGOs, organisational memory can wane and best practice experiences are not widely disseminated.

At field level, it is common for government veterinary staff to be involved in NGO projects. However, at central level, Veterinary Services or statutory bodies in developing countries often lack procedures for registering and monitoring NGO activities. This problem is, in part, related to poor communication between the government agency responsible for approving NGO proposals, donors and the Veterinary Services. However, in some countries, government departments dealing with emergency relief, rural affairs or other issues also establish CAHW projects without consulting the Veterinary Service.

In Ethiopia and Kenya, statutory bodies are developing national guidelines for the implementation of CAHW systems. Government and NGO stakeholders in Kenya are also discussing the need for a Memorandum of Understanding, based on national guidelines, between the Department of Veterinary Services and any agency wishing to support CAHWs. At present, few developing countries have designated veterinary officers at central government level responsible for overseeing and co-ordinating CAHW activities. Considering the importance of privatisation, the potential for CAHWs to strengthen private practice in rural areas and the need to improve national disease surveillance systems, the creation of specific privatisation units at central level should be a priority.

### **Incoherent relief and development assistance**

In emergency and relief situations such as drought, conflict or livestock disease epidemics, a common response of aid agencies is to provide free or subsidised veterinary drugs. However, without careful planning with communities, CAHWs, government and private suppliers of veterinary products, these programmes can seriously undermine the financial sustainability of existing private services (6). Private veterinarians and para-veterinary professionals who are running businesses cannot compete with cheap drugs supplied directly to livestock keepers by aid agencies or government staff. These programmes also create much confusion among livestock keepers, particularly if another programme (sometimes funded by the same donor) has been working with them to develop a privatised system based on real market costs. This problem is partly an issue of co-ordination between the relief and development sections of donors, but ultimately, clarification of policy on veterinary relief interventions is the responsibility of governments.

## Future requirements for improving privatised, veterinary-supervised community-based animal health workers systems

The use of CAHWs and other para-veterinary professionals in marginalized areas of developing countries is supported by economic theory and the principles of community participation. Actual field experience from privatised CAHW systems clearly shows that these approaches are cost-effective, supported by livestock keepers and can be based on complementary relationships between CAHWs, other para-veterinary professionals and veterinarians. There is also great potential for improving disease surveillance by integrating reports from CAHWs into official reporting systems. Despite these findings, few developing countries have policies or legislation that enable CAHWs to function as a component of veterinary-supervised, private clinics or pharmacies. Calls for policy and legislative reform are not new and have been a feature of international workshops, research studies and policy analyses for many years. However, limited institutional support to CAHWs continues to be the main constraint to establishing basic, sustainable services for livestock keepers in marginalized areas. Although some Veterinary Services have made substantial progress by legitimising CAHWs and producing national guidelines for their training and licensing, in many countries these para-veterinary professionals are unregulated and receive no supervision or refresher training.

The OIE *Terrestrial Code* states that it is the responsibility of governments to regulate and co-ordinate veterinary activities within a territory, therefore, the Interafrican Bureau for Animal Resources has produced guidelines intended to assist countries in Africa in organising CAHW systems in line with OIE recommendations (see Annexe below). The guidelines refer to the need for governments to include CAHWs in the subsidiary veterinary legislation and to define procedures to ensure the quality of the training and supervision of these professionals. To make adherence to these guidelines more straightforward, it is recommended that specific tasks related to CAHW co-ordination and quality control be assigned to government officers at central level. As regards disease surveillance, such officers could also be responsible for working with national epidemiology units to ensure that CAHW reports are utilised in official disease reporting systems.

## Acknowledgements

A. Catley, T. Leyland and D.M.O. Akabwai have been seconded to the African Union/Interafrican Bureau for Animal Resources (AU/IBAR) from the Feinstein International Famine Centre, School of Nutrition, Science and Policy, Tufts University, USA, with funding from the Department for International Development, UK, the Regional Economic Development Services Office, United States Agency for International Development (USAID) and the Office for Foreign Disaster Assistance, USAID.

## Annexe

### African Union/Interafrican Bureau for Animal Resources

### Policy on community-based animal health workers

(April 2003)

#### Introduction

The African Union/Interafrican Bureau for Animal Resources (AU/IBAR) has many years of experience of strengthening primary-level veterinary services through the use of community-based animal health workers (CAHWs). This policy document details the position of the bureau on CAHWs and describes appropriate supervision and

regulation of this type of veterinary worker. The policy has been formulated with reference to the *Terrestrial Animal Health Code (Terrestrial Code)* of the OIE (World organisation of animal health). In addition, AU/IBAR recognises the recommendations of the conference Primary Animal Healthcare in the 21st Century: shaping the policies, rules and institutions, held in Mombasa in October 2002, the expert consultation of the Food and Agriculture Organization in October 2002 and the OIE *Ad hoc* committee in February 2003. The policy document supersedes any policy statements from specific AU/IBAR projects.

The policy document adopts OIE terminology and readers are advised to consult Chapters 1.3.3. and 1.3.4. of the *Terrestrial Code*.

## **Policy guidelines on community-based animal health workers**

### **Organisation and structure of Veterinary Services**

The bureau defines a CAHW as a person who performs a limited range of veterinary tasks as defined by the statutory body in a given country. Within the *Terrestrial Code*, a CAHW is regarded by AU/IBAR as a category of para-professional. The policy of the AU/IBAR is that CAHW activities should be regulated by the statutory body. Definition of roles, levels of supervision and reporting relationships enables Veterinary Services to describe lines of command and formal relationships.

The bureau recommends that duties to ensure the quality of CAHWs are assigned to named officers of the statutory body and that these duties are defined in the job descriptions and performance assessment procedures for the named officers. The bureau also recommends that the statutory body is enabled to delegate tasks to government veterinary officers to ensure quality of CAHWs at field level. For the purpose of this policy document, such veterinary officers are termed 'veterinary inspectors'.

### **Legislation**

The policy of AU/IBAR is that the definition, roles, regulation and supervision of CAHWs should be defined in veterinary legislation. The bureau recommends that legislation specific to CAHWs be placed in subsidiary legislation.

### **Quality control**

Veterinary services need to develop objective and transparent systems for the accreditation, monitoring and supervision of CAHWs.

#### *Training curriculum for community-based animal health workers*

The training of CAHWs should follow a standard curriculum endorsed by the statutory body. The standard CAHW curriculum should comprise two components:

- a) essential knowledge and skills required by all CAHWs regardless of their location
- b) area-specific knowledge and skills according to priority needs in different ecological zones and livestock productions systems.

#### *Trainers of community-based animal health workers*

The qualifications required by trainers of CAHWs should be defined by the statutory body. The statutory body should maintain a register of recognised CAHW trainers.

#### *Inspection of training*

Training courses for CAHWs should be assessed by veterinary inspectors. Statutory bodies should develop standardised methods for assessment of CAHW training courses. Indicators for assessment of CAHW training courses are available from AU/IBAR.

### *Examination of community-based animal health workers*

The examination of CAHWs should be based on standardised tests endorsed by the statutory body and designed to assess both the technical knowledge and practical skills of CAHWs according to the standardised training curriculum. Veterinary inspectors shall ensure that examination of CAHWs is conducted according to standardised tests. Indicators for the examination of CAHWs are available from AU/IBAR.

### *Licensing of community-based animal health workers*

The statutory body should license CAHWs and maintain a register of licensed CAHWs. Veterinary inspectors should issue licenses. A license should be location specific and name the veterinarian responsible for the activities of the CAHW. Licenses should be renewed annually according to annual assessment of the CAHW knowledge and skills by veterinary inspectors.

### *Supervision and responsibility for community-based animal health workers*

Statutory bodies should define systems for supervision and responsibility of CAHWs. Supervision by veterinary inspectors should include measures of CAHW knowledge of disease diagnosis and use of veterinary pharmaceuticals, and CAHW practical skills. Two types of statutory supervision can be defined:

#### *a) post-training supervision*

The experience of AU/IBAR indicates that most technical or communication problems with CAHWs occur within three months after training. After CAHWs have been trained and working for no more than three months, post-training supervision should be conducted using a standardised method. The post-training supervision is a more comprehensive assessment of CAHW performance than routine supervision (see 'routine supervision' below). Indicators for post-training supervision are available from AU/IBAR.

#### *b) routine supervision*

Routine supervision consists of regular monitoring of CAHWs by veterinary inspectors. A standardised system of routine supervision should be established to provide objective measures of CAHW performance. Sample sizes and sampling methods should ensure statistical confidence in the overall system. Indicators for routine supervision are available from AU/IBAR.

Veterinarians responsible for CAHW activities, such as those working for non-governmental agencies, the private sector or associations, will be named on CAHW licences as detailed in the section 'Licensing of community-based animal health workers'.

## **Coherence with policies on veterinary service restructuring and privatisation**

Implementation of quality CAHW systems at national level is highly dependent on clear policy on veterinary service restructuring and adequate government support to statutory bodies and veterinary inspectors to fulfil their regulatory roles. The policy of the AU/IBAR is that national veterinary services should review the capacity and structure of statutory bodies and ensure that restructuring leads to strengthened regulatory capacity. At field level, viable privatised veterinarian-CAHW networks partly depend on clear policy, on veterinary privatisation and on the sub-contracting of public sector tasks to the private sector.

Acting Director, AU/IBAR, April 2003  
(Due for revision March 2004).

## African Union/Interafrican Bureau for Animal Resources

### Indicators for the assessment of community- based animal health workers within veterinary services

#### Introduction

The following indicators are designed to assist veterinary authorities to assess the co-ordination, quality and monitoring of CAHWs. The indicators can be adapted to the particular needs and resources of a given country. However, according to the principles of the OIE *Terrestrial Code* a veterinary administration should be able to describe and demonstrate how personnel, resources and procedures are arranged in order to ensure adequate control of para-professionals such as CAHWs.

The indicators assume that at field level:

- a) specified government veterinary officers act as veterinary inspectors on behalf of the statutory body
- b) the immediate supervisors of CAHWs are either veterinarians or cadres of para-veterinary professionals with higher qualifications than CAHWs and who are authorised by the statutory body to act as CAHW supervisors
- c) the CAHW supervisors may be positioned in either the private or public sector.

#### **General indicators for the co-ordination and control of community-based animal health workers by veterinary authorities**

In order to demonstrate effective co-ordination and control of CAHWs, a veterinary authority should refer to the following indicators:

- a) the veterinary authority should assign CAHW co-ordination and quality control tasks to named officers at central level and these tasks should be detailed in the job descriptions and performance assessment procedures for these officers
- b) the role and specific tasks of CAHWs should be defined in the veterinary regulations of the statutory body
- c) the statutory body should delegate field-level CAHW supervisory and quality-control tasks to government veterinary officers. Clear written procedures should exist for the specific CAHW supervisory and regulatory tasks to be performed by these officers
  - d) a procedure should exist ensuring that all proposals for new CAHW projects by non-governmental organisations (NGOs), private veterinarians and governmental agencies are screened by the veterinary authority to guarantee adherence to quality control indicators and minimum standards (as devised by the statutory body in collaboration with the veterinary authority). Specifically:
    - the veterinary authority should establish and maintain a relationship with the government agencies responsible for registration of NGOs and approval of proposals by these agencies. All proposals with an animal health component should be evaluated by the veterinary authority
    - in some countries, non-agriculture or livestock government agencies establish CAHW systems in isolation of the veterinary authority. The veterinary authority should

establish and maintain a relationship with these agencies and ensure that all proposals with an animal health component are evaluated by the veterinary authority

– proposals for new CAHW projects that are assessed to be of sufficient standard should form the basis of a Memorandum of Understanding between the veterinary authority and the implementing agency

– the veterinary authority should ensure that all donors, NGOs and relevant government agencies are informed about the requirements for the establishment of CAHW systems. Written guidance on these requirements should be disseminated to all relevant organisations and agencies annually.

### **Indicators for the inspection of community-based animal health worker training courses**

Veterinary inspectors nominated and trained by the veterinary authority and the statutory body are responsible for ensuring that CAHW training courses are designed and implemented according to the indicators below.

#### **Training and registration of community-based animal health worker trainers**

The veterinary authority should ensure that any person training CAHWs is registered as a CAHW trainer by the statutory body. The required academic qualifications of CAHW trainers should be defined by the statutory body and trainers should have themselves been trained in participative training techniques.

#### **Use of a national community-based animal health worker curriculum**

Training of CAHWs should be based on a national CAHW curriculum that is endorsed by the statutory body. A participative training methodology should be used. The national CAHW curriculum should comprise a standardised component required by all CAHWs, and a location-specific component to account for variations in the livestock disease situation in different ecological zones and production systems.

#### **Ratio of trainers to trainees**

The number of trainees per trainer should not exceed fifteen.

#### **Location of training**

Training should take place in the location to be covered by the CAHWs and near to the communities they will serve.

#### **Duration of training**

The duration of training will depend on the national CAHW curriculum but should not be less than fourteen to twenty-one days for the initial training course, and five to ten days for subsequent refresher courses.

#### **Use of translators**

The use of translators during training should be avoided; training should be conducted in the mother language of the trainees.

#### **Practical content of the training**

At least 50% of the training duration should consist of practical sessions. The practical sessions should include use of livestock for clinical examinations and practising the use of treatments or vaccines under the supervision of the trainer(s).

### **Examination of community-based animal health workers**

The statutory body should endorse the use of a standardised procedure for the examination of CAHWs. In line with the national curriculum, the examination will comprise a standardised component for use with all CAHWs and a location-specific component according to disease problems in specific areas. The examination should comprise oral interviews with CAHWs to assess knowledge and practical tasks to assess skills. Each CAHW should be asked the same questions and requested to demonstrate the same practical skills. The examiners should include the registered trainer and the CAHW supervisor. Certificates should be issued to qualified CAHWs by a veterinary inspector.

### **Indicators for monitoring community-based animal health workers**

#### **Post-training assessment**

A post-training assessment of CAHWs should be conducted by a veterinary inspector between two and four months after the initial training course. This assessment should comprise:

- a)* assessment of CAHW knowledge and skills using a similar standardised methodology to the examination of CAHWs developed in the section 'Examination of community-based animal health workers'
- b)* standardised interviews with CAHW supervisors to cross-check results obtained from point *a* above

#### **Routine monitoring of community-based animal health workers**

- a)* the CAHWs should provide, in person, a completed reporting format to their supervisor on a regular basis. The frequency of reporting shall depend on operational factors, but should not be less than every two months
- b)* the CAHW supervisors should compile CAHW reports and submit them to a veterinary inspector on a regular basis. The content of these reports should be defined by the statutory body in consultation with the veterinary administration
- c)* all CAHWs shall receive refresher training at least once per year. The refresher training should be assessed by a veterinary inspector according to the training indicators listed in the section 'Indicators for the inspection of community-based animal health worker training courses'.

### **Note on definitions**

**Veterinary administration:** the governmental veterinary service having authority in the whole country for implementing the animal health measures and international veterinary certification process which the OIE recommends, and supervising or auditing their application.

**Veterinary authority:** a veterinary service, under the authority of the veterinary administration, which is directly responsible for the application of animal health measures in a specified area of the country. This authority may also have responsibility for issuing or supervising the issuing of international veterinary certificates in that area.

**Veterinary services:** these services comprise the veterinary administration and all the veterinary authorities.

## Appendix 1

# Economic assessment of different models of private veterinary service delivery in pastoralist areas of Kenya

In Kenya there are at least four models for the delivery of private, basic animal health services in pastoralist areas, as outlined below.

### **Private veterinarian/animal health assistant/community-based animal health worker model**

This model places a private veterinarian at the top of a system for supplying and supervising a number of animal health assistants (AHAs), who in turn supply and supervise a larger number of CAHWs.

### **Private animal health assistant/community-based animal health worker model**

This model uses only private AHAs and CAHWs. Although there is no veterinarian in the business, the model is subject to inspection by a government district veterinary officer (DVO).

### **Pastoral association model**

This model uses an association of livestock keepers to manage CAHWs. As part of this responsibility the livestock keepers provide incentives and supply veterinary drugs.

### ***Duka* model**

A *duka* is a small shop that sells various domestic and food items. These shops often sell human and animal drugs, but are not licensed.

### **Economic assessment**

A research team led by an economist and expert in small business development assessed each of these models by reference to standard financial indicators of business performance and the Durham business model. The study concluded that the AHA-CAHW model was economically viable and had clear advantages over the other models, as follows:

- private veterinary model: findings demonstrated that veterinarians showed no interest in pastoralist areas ‘presumably because of insecurity, poor infrastructure, lower incomes and high delivery costs.’ The AHA-CAHW model could cope with these conditions better than veterinarians
- pastoral association model: the AHA-CAHW model required far lower investment and was established more rapidly; therefore this model was more likely to be replicable on a large scale in pastoralist areas. The pastoral associations suffered from weak management and lack of technical support
- *duka* model: the AHAs and CAHWs are well-trained and able to provide a good quality service. Although *dukas* performed well as small businesses, the sale of veterinary products received no institutional support (75).

## Appendix 2

### Selection criteria for community-based animal health workers

#### **FARM-Africa, Ethiopia**

Ideally, trainees should be selected by the community they will serve. They should be responsible, respected members of the community and should be willing to serve the community. In addition, they should be successful livestock keepers themselves. They should be prepared to serve for a reasonable period and be unlikely to leave soon after training has been completed. Trainees are not required to be able to read or write, although this is an added bonus. Illiteracy should not prevent otherwise suitable candidates from being trained. Ideally, at least two trainees should be trained per community so that if one is ill or leaves the community, the other will remain.

#### **Intermediate Technology Development Group, Kamujine, Kenya**

Trainees should:

- have demonstrated a commitment to helping their communities
- be honest
- be established, married with children and have livestock of their own
- be healthy and able and willing to walk long distances.

#### **German Agency for Technical Co-operation, Central Rangelands Development Project, Somalia**

Nomadic AHAs ought to be:

- innovative, receptive and young (preferably between twenty and thirty years old)
- well accepted by, and integrated in, their nomadic community
- able to read, write and calculate on a basic level
- willing to travel over some distance without a vehicle.

Exceptions are possible, especially regarding the educational level, if a *sacoyaqaan* (traditional healer) is proposed for the training.

#### **United Nations Development Programme, Community Development for Remote Township Project, Myanmar, Burma**

Livestock volunteer workers should:

- be educated (at least secondary education)
- have community spirit
- be supported by the majority of villagers
- be wealthy
- be ready to serve the community at all times
- be aged between twenty-five and forty years.

#### **Vétérinaires sans frontières-Belgium, southern Sudan**

Trainees should:

- be cattle owners
- have grown up among cattle and their livelihood should revolve around cattle
- be known by the people
- be young, healthy and energetic
- be obedient
- be respectful
- not be a thief or drunkard
- not be a town-dweller
- be literate or illiterate (32).

## Appendix 3

# The effect of poor drug supply on community-based animal health worker systems

Weaknesses in non-privatised veterinary drug supply systems often lead to insufficient supplies of drugs for CAHWs that can entail the consequences listed below.

### **Reduced incentives**

In many projects, the cash incentives for CAHWs are derived from drug sales and treatments. As drug supplies fail, so do the rewards for the CAHWs.

### **Reduced credibility**

Livestock keepers become frustrated when CAHWs are unable to provide the services that were agreed during the initial stages of the project. Trust in the system wanes as people realise 'Yes, we have a CAHW, but still our animals are sick.'

### **Pressure from the powerful**

When drug supplies are limited, CAHWs face pressure from powerful members of the community to either 'Treat our animals first' or 'Keep the drugs in case our animals become sick.' When CAHWs succumb to this pressure, other people feel resentment and lose trust in the system.

### **Limited monitoring and refresher training**

Drug distribution to CAHWs from a project or government store is often an opportunity to collect monitoring reports from the CAHWs or provide updates about new drugs. If CAHWs suspect that drugs may not be available, they visit the store less frequently and contact is weakened or lost.

### **Drugs from alternative sources**

If drug supply via a project or government fails, some CAHWs will seek drugs elsewhere. This behaviour is not a problem if good-quality drugs are available from other sources, but becomes a problem if CAHWs obtain poor-quality drugs from markets or illegal traders (20).

## Les paravétérinaires et la mise en place de services communautaires autosuffisants de qualité

A. Catley, T. Leyland, J.C. Mariner, D.M.O. Akabwai, B. Admassu, W. Asfaw, G. Bekele & H.Sh. Hassan

### Résumé

Pour les ménages ruraux des pays en développement, le bétail représente un patrimoine d'autant plus précieux qu'il est de plus en plus perçu comme une assurance contre la pauvreté. Toutefois, les zones rurales n'offrent souvent qu'un accès limité aux services vétérinaires, lorsque de tels services sont disponibles. Il ressort d'une théorie économique que les paravétérinaires établis à leur compte ou travaillant comme agents de proximité pour les cliniques ou les pharmacies vétérinaires des petits centres urbains peuvent assurer les services primaires. L'expérience acquise dans le cadre des programmes des auxiliaires communautaires de la santé animale (ACSA) témoigne de l'impact considérable que ces auxiliaires peuvent avoir sur la réduction de la morbidité et de la mortalité des animaux grâce au traitement ou à la prévention d'un nombre limité de maladies animales. La participation de la collectivité à la conception et à la réalisation de ces programmes, de même que l'implication du secteur privé au niveau de l'offre et de la supervision des programmes ACSA, sont des facteurs essentiels à la réussite. S'appuyant sur quelques exemples de réseaux ACSA privés, supervisés par des vétérinaires, les auteurs illustrent l'énorme potentiel de ce modèle simple pour l'amélioration des services primaires de santé animale dans les zones éloignées. Une analyse des contraintes a révélé que l'inadaptation des réglementations et des politiques était très inquiétante. S'inspirant de la section du *Code sanitaire pour les animaux terrestres* de l'OIE consacrée à l'évaluation des Services vétérinaires, les auteurs proposent plusieurs lignes directrices pour assister les gouvernements dans l'amélioration de la réglementation, de la qualité et de la coordination des programmes ACSA privés, supervisés par les vétérinaires.

### Mots-clés

Auxiliaire communautaire de la santé animale – Législation vétérinaire – Pays en développement – Personnel paravétérinaire – Politique – Privatisation – Service primaire de santé animale – Surveillance des maladies.



## Personal paraveterinario y creación de servicios comunitarios de calidad y autosuficientes

A. Catley, T. Leyland, J.C. Mariner, D.M.O. Akabwai, B. Admassu, W. Asfaw, G. Bekele & H.Sh. Hassan

### Resumen

Además de ser un activo importante para los hogares rurales del mundo en desarrollo, el ganado se considera cada vez más un instrumento para la reducción de la pobreza. Sin embargo, muchas zonas rurales se caracterizan por la ausencia o la escasa presencia en ellas de servicios veterinarios. De la teoría económica se desprende que los servicios de nivel primario pueden ser

dispensados por profesionales paraveterinarios que trabajen a título privado y representen una suerte de "brazo" rural de las clínicas y farmacias veterinarias de los pequeños núcleos urbanos. La experiencia obtenida con la creación de sistemas de personal zosanitario de ámbito comunitario demuestra que la presencia de esos trabajadores, que se ocupan del tratamiento y la prevención de unos pocos problemas de sanidad animal, puede influir sensiblemente en los niveles de morbilidad y mortalidad del ganado. Entre los factores necesarios para el éxito de tal dispositivo figuran la participación de la comunidad en su concepción y aplicación y la colaboración del sector privado a la hora de suministrar dicho personal zosanitario y de supervisar su trabajo. Los autores exponen ejemplos de este tipo de redes privatizadas y supervisadas por veterinarios para poner de relieve las notables posibilidades que ofrece este sencillo modelo de cara a mejorar los servicios de atención zosanitaria primaria en zonas marginadas. Del análisis de los posibles obstáculos se desprende que el principal motivo de preocupación debe ser la existencia de políticas y normas inadecuadas. Refiriéndose al capítulo del *Código sanitario* para los animales terrestres de la OIE (Organización mundial de sanidad animal) dedicado a la evaluación de los Servicios Veterinarios, los autores proponen directrices que ayuden a los gobiernos a mejorar la reglamentación, calidad y coordinación de los sistemas de personal zosanitario comunitario privados y supervisados por veterinarios.

#### Palabras clave

Legislación veterinaria – País en desarrollo – Personal paraveterinario – Personal zosanitario de ámbito comunitario – Política – Privatización – Servicio de atención



## References

1. Admassu B. (2003). – Primary animal healthcare in Ethiopia: the experience so far. *In Primary animal health care in the 21st Century: shaping the rules, policies and institutions*. Proc. International Conference (K. Sones & A. Catley, eds), 15-18 October 2002, Mombasa. African Union/Interafrican Bureau for Animal Resources, Nairobi, 38-40.
2. Ahuja V., George P.S., Ray S., McConnell K.E., Kurup M.P.G., Gandhi V., Umali-Deining D. & de Haan C. (2000). – Agricultural livestock services and the poor: case of livestock health and breeding services in India. Indian Institute of Management, Ahmedabad; Swiss Agency for Development and Cooperation, Bern; and the World Bank, Washington, DC, 148 pp.
3. Ahuja V. & Sen A. (2002). – Livestock service delivery and the poor: case of rural Orissa. Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, 92 pp.
4. Akabwai D.M.O. (1994). – Community-based rinderpest vaccination Afar training seminar. Pan African Rinderpest Campaign, Ethiopia and the Thermostable Rinderpest Vaccine Transfer of Technology project. Organisation of African Unity/Interafrican Bureau for Animal Resources, Nairobi, 38 pp.
5. Akkara J.J. (1998). – Strengthening village animal health care through the use of ethnoveterinary and modern medicine by barefoot technicians. *In Ethnoveterinary medicine: alternatives for livestock development*. Proc. International Conference (E. Mathias, D.V. Rangnekar, C.M. McCorkle & M. Martin, eds), 4-6 November. BAIF (Bharatiya Agro Industries Foundation) Development Research Foundation, Pune, 29.
6. Aklilu Y. & Wekesa M. (2002). – Drought, livestock and livelihoods: lessons from the 1999-2001 emergency response in the pastoral sector in Kenya. Humanitarian Practice Network Paper 40. Overseas Development Institute, London, 40 pp.
7. Anon. (1984). – Seminar on a basic animal health structure: summary report. Technical Centre for Agricultural and Rural Cooperation, Wageningen, 31 pp.
8. Anon. (1985). – Proceedings of the seminar on primary animal health care in Africa, 25-28 September, Blantyre. Technical Centre for Agricultural and Rural Cooperation, Wageningen, 122 pp.

9. Ashley S. (1997). – The Aga Khan rural support programme in Pakistan: an assessment of the animal health component. Department for International Development (DFID) Policy Research Programme R6120CA. DFID, London, 48 pp.
10. Barrett K. & Okali C. (1998). – For tsetse control: community participation and other options. *World Anim. Rev.*, **90** (1), 39-46.
11. 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, 56 pp.
12. Baumann M.P.O. (1993). – Animal health services in Somalia: can centralised structures meet demand in the field? *In* Pastoral production in Central Somalia (M.P.O. Baumann, J. Janzen & H.J. Schwartz, eds). Deutsche Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Co-operation), Eschborn, 299-321.
13. Bekele G. (2002). – Assessment report on the Save the Children UK community-based animal health and private veterinary support project in the Somali National Regional State, Ethiopia. Community-based Animal Health and Participatory Epidemiology Unit, African Union/Interafrican Bureau for Animal Resources, Nairobi, 37 pp.
14. Bruggeman H. (1993). – Pastoral associations in Chad. Oxfam Research Paper No. 7. Oxfam, Oxford, 39 pp.
15. Cassagne M.-H. (2002). – Managing compensation for economic losses in areas surrounding foot and mouth disease outbreaks: the response of France. *In* Foot and mouth disease: facing the new dilemmas (G.R. Thomson, ed.). *Rev. sci. tech. Off. int. Epiz.*, **21** (3), 823-829.
16. Catley A. (1996). – Pastoralists, paravets and privatisation: experiences in the Sanaag region of Somaliland. Pastoral Development Network Paper 39d. Overseas Development Institute, London, 12 pp.
17. Catley A. (1999). – Community-based animal health care in Somali areas of Africa: a review. Organisation of African Unity/Interafrican Bureau for Animal Resources, Nairobi, 57 pp.
18. Catley A. & Leyland T. (2001). – Community participation and the delivery of veterinary services in Africa. *Prev. vet. Med.*, **49**, 95-113.
19. Catley A., Leyland T. & Blakeway S. (eds) (2002). – Community-based animal healthcare: a practical guide to improving primary veterinary services. Intermediate Technology Development Group (ITDG) Publishing, London, 368 pp.
20. Catley A., Leyland T. & Kaberia B. (2002). – Taking a long-term perspective: sustainability issues. *In* Community-based animal healthcare: a practical guide to improving primary veterinary services (A. Catley, S. Blakeway & T. Leyland, eds). Intermediate Technology Development Group (ITDG) Publishing, London, 51-103.
21. Coly R., Youm B.G. & Ly C. (2003). – CAHWs in Senegal: problems and prospects for action. *In* Primary animal health care in the 21st Century: shaping the rules, policies and institutions. Proc. International Conference (K. Sones & A. Catley, eds), 15-18 October 2002, Mombasa. African Union/Interafrican Bureau for Animal Resources, Nairobi, 15.
22. Dasebu S., Escrivao R. & Oakley R. (2003). – The safe administration of medicines: can CBAHWs be trusted? *In* Community based animal health workers: threat or opportunity? The IDL Group, Crewkerne, 43-55.
23. De Haan C. & Nissen N.J. (1985). – Animal health services in sub-Saharan Africa: alternative approaches. World Bank Technical Paper no. 44. The World Bank, Washington, DC, 96 pp.
24. De Haan C. & Bekure S. (1991). – Animal health services in sub-Saharan Africa: initial experiences with new approaches. The World Bank, Washington, DC, 64 pp.
25. Doornbos M. & Nair K.C. (eds) (1990). – Resources, institutions and strategies: operation flood and Indian dairying. Sage Publications, New Delhi, 400 pp.
26. English J. (1998). – Grassroots pastoral organisations in Mauritania: the second livestock project. Report number 18133 IER. Operations Evaluation Department, The World Bank, Washington, DC, 6 pp.
27. Farrington J., Lewis D., Satish S. & Miclat-Teves A. (eds) (1993). – Non-governmental organizations and the state in Asia. Overseas Development Institute and Routledge, London, 366 pp.
28. Food and Agriculture Organization (FAO) (1997). – FAO electronic conference on principles for rational delivery of public and private veterinary services. 25-27 March, Rome. FAO, Rome.
29. Gitala P.M., McDermott J.J., Kyule M.N. & Gathuma J.M. (2000). – Community-based active surveillance for rabies in Machakos District, Kenya. *Prev. vet. Med.*, **44**, 73-85.
30. Gleeman G. (1999). – Service management in livestock development: concepts and elements. Deutsche Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Co-operation), Eschborn, 430 pp.
31. Hadrill D. (1989). – Vets in Nepal and India: the provision of barefoot animal health services. *In* The barefoot book: economically appropriate services for the rural poor (M. Carr, ed.). Intermediate Technology Development Group (ITDG) Publishing, London, 13-19.
32. Hadrill D., Catley A. & Iles K. (2002). – Getting started. *In* Community-based animal healthcare: a practical guide to improving primary veterinary services (A. Catley, S. Blakeway & T. Leyland, eds). Intermediate Technology Development Group (ITDG) Publishing, London, 10-50.
33. Hanks J., Oakley R., Opoku H., Dasebu S. & Asaga J. (1999). – Assessing the impact of community animal health care programmes: some experiences from Ghana. Veterinary Epidemiology and Economics Research Unit, Department of Agriculture, University of Reading, Reading, and the Livestock Planning and Information Unit, Veterinary Services Department, Ministry of Food and Agriculture, Accra, 21 pp.
34. Hesse C. (2000). – Pastoral organisations in West Africa. International Institute for Environment and Development, London, 16 pp.

35. Holden S. (1997). – Community-based animal health workers in Kenya: an example of private delivery of animal health services to small-scale farmers in marginal areas. Department for International Development (DFID) Policy Research Programme R6120CA. DFID, London, 17 pp.
36. Holden S., Ashley S. & Bazeley P. (1996). – Improving the delivery of animal health services in developing countries: a literature review. *Livestock in Development*, Crewkerne, 96 pp.
37. Hooton N. (2000). – Demand-led animal health services for small-holder farmers in Africa: the potential role of contingent valuation. MSc thesis, University of Edinburgh, 101 pp.
38. Hopkins C. & Short A. (2002). – Participatory impact assessment in Ethiopia: linking policy reform to field experiences. *PLA Notes*, 45, 23-28.
39. Hott R.D. (ed.) (1998). – Training village animal health workers in Nepal. Part II: development of a national skill test. Rural Development Centre, Pokhara, 40 pp.
40. Hüttner K. (2000). – Impact assessment of a community-based animal health program in northern Malawi. MVS (Epidemiology) thesis, Massey University, 117 pp.
41. Iles K. (1998). – Community animal health workers in Karamoja: a report for the Pan African Rinderpest Campaign (PARC) Uganda. *Livestock in Development*, Crewkerne, 56 pp.
42. Iles K. (2002). – How to design and implement training courses. In *Community-based animal healthcare: a practical guide to improving primary veterinary services* (A. Catley, S. Blakeway & T. Leyland, eds). Intermediate Technology Development Group (ITDG) Publishing, London, 149-182.
43. Iles K. (2002) – Participative approaches and methods. In *Community-based animal healthcare: a practical guide to improving primary veterinary services* (A. Catley, S. Blakeway & T. Leyland, eds). Intermediate Technology Development Group (ITDG) Publishing, London, 104-148.
44. Imakando M. (1998). – A case study on the experiences of the delivery of community-based animal health services in Zambia. In *Proc. Workshop on the delivery of animal health services in Eastern Africa* (C. Daborn, P. Njau, S. Wood & M. Martin, eds), 14-18 December, MS Danish Centre, Usa River, Arusha. VETAID, Penicuik and Technical Centre for Agricultural and Rural Cooperation, Wageningen, 86-98.
45. Jones B.A., Deemer B., Leyland T.J., Mogga W. & Stem C. (1998). – Community-based animal health services in southern Sudan: the experience and the future. In *Proc. 9th International Conference of the Association of Institutions for Tropical Veterinary Medicine (AITVM)*, 14-18 September, Harare. Faculty of Veterinary Science, University of Zimbabwe, Harare, 107-133.
46. Jones K.E. (1994). – Legislation affecting the delivery of animal health services by paraveterinary personnel. MSc thesis, University of Edinburgh, 67 pp.
47. Kenya Veterinary Board (2002). – Minimum standards and guidelines for training community-based animal health workers in Kenya. Kenya Veterinary Board and Department of Veterinary Services, Nairobi, 27 pp.
48. Lecomte B.J. & Krishna A. (1997). – Six-S: building upon traditional social organisations in francophone West Africa. In *Reasons for hope: instructive experiences in rural development* (N. Uphoff, M.J. Esman & A. Krishna, eds). Kumarian Press, West Hatford, 75-90.
49. Leidl K. (1996). – Development of primary animal healthcare systems: examples based on the animal health project in Northeast Thailand and the basic animal health service project in Northern Malawi. In *Primary animal health activities in Southern Africa*. Proc. International Seminar (W. Zimmerman, D.U. Pfeiffer & K.-H. Zessin, eds), 26 February-8 March, Mzuzu. German Foundation for International Development and Food and Agriculture Centre, Feldafing, 40-51.
50. Leksmono C. & Young J. (2003). – Indonesian experience in introducing a pro-poor focus in the livestock sector. In *Primary animal health care in the 21st Century: shaping the rules, policies and institutions*. Proc. International Conference (K. Sones & A. Catley, eds), 15-18 October 2002, Mombasa. African Union/Interafrican Bureau for Animal Resources, Nairobi, 41-43.
51. Leonard D.K. (1987). – The supply of veterinary services: Kenyan lessons. *Agric. Admin. Extens.*, 26 (4), 219-236.
52. Leonard D.K., Koma L.M.P.K. & Woods P.S.A. (1999). – The new institutional economics of privatising veterinary services in Africa. In *The economics of animal disease control* (B.D. Perry, ed.). *Rev. sci. tech. Off. int. Epiz.*, 18 (2), 544-561.
53. Leonard D.K., Ly C. & Woods P.S.A. (2003). – Community-based animal health workers and the veterinary profession in the context of African privatisation. In *Primary animal health care in the 21st Century: shaping the rules, policies and institutions*. Proc. International Conference (K. Sones & A. Catley, eds), 15-18 October 2002, Mombasa. African Union/Interafrican Bureau for Animal Resources, Nairobi, 19-21.
54. Leyland T. (1996). – The case for a community-based approach with reference to southern Sudan. In *The world without rinderpest*. Food and Agriculture Organization (FAO) Animal Production and Health Paper no. 129. FAO, Rome, 109-120.
55. Leyland T., Akabwai D. & Mutungi P. (1998). – Delivery of private veterinarian supervised community-based animal health services to arid and semi-arid pastoralist areas: are they a viable and sustainable option? In *Proc. Workshop on the delivery of animal health services in Eastern Africa* (C. Daborn, P. Njau, S. Wood & M. Martin, eds), 14-18 December, MS Danish Centre, Usa River, Arusha. VETAID, Penicuik and the Technical Centre for Agricultural and Rural Co-operation, Wageningen, 132-145.
56. Leyland T. & Catley A. (2003). – Community-based animal health delivery systems: improving the quality of veterinary service delivery. In 'Organisation of veterinary services and food safety', seminar proceedings, Tunis, 27-28 September, 2002. OIE (World organisation for animal health), Paris, 129-144.
57. *Livestock in Development* (1998). – Strategies for improving the Department for International Development's impact on poverty reduction: a review of best practice in the livestock sector. *Livestock in Development*, Crewkerne, 57 pp.

58. Ly C. (2003). – The economics of community based animal health workers. *In* Community based animal health workers: threat or opportunity? The IDL Group, Crewkerne, 91-107.
59. McCorkle C.M. (2003). – Community based animal health workers: the story so far. *In* Community based animal health workers: threat or opportunity? The IDL Group, Crewkerne, 21-41.
60. McCorkle C.M. (2003). – Do CBAHWs provide services that work? Evidence of impact from Kenya, Tanzania and the Philippines. *In* Community based animal health workers: threat or opportunity? The IDL Group, Crewkerne, 76-90.
61. McCorkle C.M. & Mathias E. (1996). – Paraveterinary healthcare programs: a global overview. *In* Livestock production and diseases in the tropics: livestock production and human welfare. Proc. VIII International Conference of the Association of Institutions for Tropical Veterinary Medicine, 25-29 September 1995, vol. II (K.-H. Zessin, ed.). German Foundation for International Development and Food and Agriculture Development Centre, Feldafing, 544-549.
62. McDermott J.J., Randolph T.F. & Staal S.J. (1999). – The economics of optimal health and productivity in smallholder livestock systems in developing countries. *In* The economics of animal disease control (B.P. Perry, ed.). *Rev. sci. tech. Off. int. Epiz.*, **18** (2), 399-424.
63. Magayane F., Woodford J.D., Magoma G., Makungu S. & Kondela A. (2001). – A preliminary assessment of key technical competence and customer views of CAHWs during their first nine months of operation in the Lake Zone of Tanzania. Animal Health Services Project, Ministry of Water and Livestock Development, Dar es Salaam, 19 pp.
64. Marchand C. & Thomé O. (1998). – Aide-mémoire pour l'évaluation, la conception et la réalisation d'actions de formation d'agents de santé animale de base. *Vétérinaires sans frontières*, Lyons, 32 pp.
65. Mariner J.C. (1996). – The world without rinderpest: outreach to marginalized communities. *In* The world without rinderpest. Food and Agriculture Organization (FAO) Animal Production and Health Paper no. 129. FAO, Rome, 97-107.
66. Mariner J.C. (1999). – Review of community-based animal healthcare in the Northern communal areas of Namibia. Food and Agriculture Organization, Rome, 39 pp.
67. Mariner J.C. (2002). – Community-based animal health workers and disease surveillance. *In* Community-based animal healthcare: a practical guide to improving primary veterinary services (A. Catley, S. Blakeway & T. Leyland, eds). Intermediate Technology Development Group Publishing, London, 240-272.
68. Mariner J.C., Catley A. & Zepeda C. (2003). – The role of community-based programmes and participatory epidemiology in disease surveillance and international trade. *In* Primary animal health care in the 21st Century: shaping the rules, policies and institutions. Proc. International Conference (K. Sones & A. Catley, eds), 15-18 October 2002, Mombasa. African Union/Interafrican Bureau for Animal Resources, Nairobi, 29-32.
69. Ministry of Agriculture, Animal and Fisheries Resources (2002). – Minimum standards for community-based animal health workers in Ethiopia. Ministry of Agriculture, Animal and Fisheries Resources, Addis Ababa, 33 pp.
70. Mozambique Veterinary Association (AVETMO)/VETAID (1999). – Village livestock promoter training and service in Gaza and Inhambane provinces, Mozambique. Evaluation, August. VETAID, Maputo, 36 pp.
71. Muchina Munyua S.J. & Wabacha K.J. (2003). – Community-based animal health in Kenya: Kenya's experiences in re-engineering its structural, policy and legal frameworks. *In* Community based animal health workers: threat or opportunity? The IDL Group, Crewkerne, 135-148.
72. Nalitolela S., Allport R., Ndanu H. & Shongon L. (2001). – Impact of animal health improvement on food security of a pastoralist community in Simanjiro District. *In* Proc. 19th Tanzania Veterinary Association Annual Scientific Conference, 4-6 December, Arusha International Conference Centre. Tanzania Veterinary Association, Morogoro, 27-39.
73. Odhiambo O., Holden S. & Ackello-Ogutu C. (1998). – Oxfam Wajir pastoral development project: an economic impact assessment. Oxfam UK/Ireland, Nairobi, 23 pp.
74. OIE (World organisation for animal health) (2003). – Terrestrial Animal Health Code. 12th Ed. OIE, Paris, 511 pp.
75. Okwiri F.O., Kajume J.K. & 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.
76. Participatory Impact Assessment Team (2003). – Participatory impact assessment of the Save the Children USA community-based animal health project, Dollo Ado and Dollo Bay, Somali National Regional State, Ethiopia. Ministry of Agriculture, Animal Industries and Fisheries, Federal Democratic Republic of Ethiopia, Addis Ababa, 22 pp.
77. Piquet C. (1996). – Mise en place d'un réseau de santé animale de base : l'expérience de projet Nenton Guatémala. *Vétérinaires sans frontières*, Lyons, 38 pp.
78. Ririmpoi B. (2002). – Integration of community animal health into private practice: the case of West Pokot District. *In* Proc. 10th Decentralised Animal Health Workshop, 8-11 September, Lake Bogoria Hotel, Kenya. Community-based Livestock Initiatives Programme, Nairobi, 29-31.
79. Riviere-Cinnamond A. & Eregae M. (2003). – Community-based animal health workers in pastoralist areas of Kenya: a study on selection processes, impact and sustainability. African Union/Interafrican Bureau for Animal Resources, Nairobi, Community-based Livestock Initiatives Programme, Nairobi, Food and Agriculture Organization, Rome and London School of Hygiene and Tropical Medicine, London, 63 pp.
80. Rubyogo J.-C., Muriithi P.M., Agumbha G. & Obhai G. (2003). – Community-based animal health workers in Kenya: a case study of Mwingi District. African Union/Interafrican Bureau for Animal Resources, Nairobi, 54 pp.

81. Rutabanzibwa A.P. & Shayo H. (2001). – Proposed amendments to the veterinary surgeons ordinance (CAP 376) as prepared by the legal framework working group. Proc. 2nd Stakeholders Workshop to review and finalise recommendations for changes to the veterinary surgeons ordinance to make provisions for the delivery of animal health services by para-veterinary professionals in Tanzania, 11-12 October. Division of Livestock Development, Ministry of Water and Livestock Development, United Republic of Tanzania, Dar es Salaam, 18-19.
82. Schillhorn van Veen T.W. & de Haan C. (1995). – Trends in the organization and financing of livestock and animal health services. *Prev. vet. Med.*, **25**, 225-240.
83. Schreuder B.E.C., Moll H.A.J., Noorman N., Halimi A.H., Kroese A.H. & Wassink G. (1995). – A benefit-cost analysis of veterinary interventions in Afghanistan based on a livestock mortality study. *Prev. vet. Med.*, **26**, 303-314.
84. Silkin T. & Kasirye F. (2002). – Veterinary services in the Horn of Africa: where are we now? A review of animal health policies and institutions focussing in pastoral areas. African Union/Interafrican Bureau for Animal Resources, Nairobi, 48 pp.
85. Stoufer K., Ojha N.D. & Parajuli A. (2002). – Village animal health workers in Nepal: the pros and cons of developing a national skills test. *PLA Notes*, **45**, 34-36.
86. Sylla D. (1989). – The experience of pastoral organisations in African countries. International Institute for Environment and Development, London, 48 pp.
87. Taylor D. (2003). – Antimicrobial resistance and community-based animal health. *In* Community based animal health workers: threat or opportunity? The IDL Group, Crewkerne, 56-64.
88. Thomé O. (2000). – Former en santé animale de base : leçons d'expériences. *Vétérinaires sans frontières*, Lyon, 32 pp.
89. Thonat J. (1993). – Formation de promoteurs d'élevage, guide méthodologique. Centre Technique de Coopération Agricole et Rurale, Wageningen and *Vétérinaires sans frontières*, Lyons, 76 pp.
90. Umali D.L., Feder G. & de Haan C. (1992). – The balance between public and private sector activities in the delivery of livestock services. World Bank Discussion Paper 163. The World Bank, Washington, DC, 136 pp.
91. Umali D.L. & Schwartz L. (1994). – Public and private agricultural extension: beyond traditional frontiers. World Bank Discussion Paper 236. The World Bank, Washington, DC, 102 pp.
92. United Mission to Nepal (1998). – Textbook for village animal health workers. Animal Health Improvement Training Programme, United Mission to Nepal, Pokhara, 200 pp.
93. United Nations Children's Fund (UNICEF)/Operation Lifeline Sudan (OLS) (1997). – A training manual for community animal health workers in Southern Sudan. UNICEF/OLS, Nairobi, 63 pp.
94. United Nations Development Programme (1994). – Basic veterinary worker technical manual. United Nations Development Programme, Office for Project Services, Kabul, 96 pp.
95. Uphoff N., Esmann M.J. & Krishna A. (1998). – Reasons for success: learning from instructive experiences in rural development. Kumarian Press, West Hatford, 232 pp.
96. VETAID (2003). – Community-based livestock disease surveillance systems in Simanjiro, Monduli and Babati Districts, Tanzania: progress report for the period January-September. VETAID, Arusha, 9 pp.
97. *Vétérinaires sans frontières* (1997). – Formation et appui aux organisations locales. Séminaire Afrique de l'Ouest, 15-18 September. *Vétérinaires sans frontières*, Lyon, 32 pp.
98. *Vétérinaires sans frontières* (VSF) Belgium (2002). – Fight against lineage 1 rinderpest virus project in southern Sudan, year 1. Report to African Union/Interafrican Bureau for Animal Resources/Pan African Programme for the Control of Epizootics and the European Union, November 2001-October 2002. VSF-Belgium, Nairobi, 55 pp.
99. *Vétérinaires sans frontières* (VSF) Belgium (2003). – Proceedings of the Rinderpest Eradication Review Meeting, 4 July, Nairobi. VSF Belgium, Nairobi, 12 pp.
100. Wanyama J. (1999). – Training manual for community-based animal health workers in Isiolo District. Intermediate Technology Kenya, Nairobi, 75 pp.
101. Werner D. & Bower B. (1982). – Helping health workers learn: a book of methods, aids and ideas for instructors at the village level. The Hesperian Foundation, Berkeley, 632 pp.
102. Young J. & Woodford J. (2002). – The rules of the game and how to influence policy. *In* Community-based animal healthcare: a practical guide to improving primary veterinary services (A. Catley, S. Blakeway & T. Leyland, eds). Intermediate Technology Development Group Publishing, London, 273-309.
103. Young J., Kajume J. & Wanyama J. (2003). – Animal health care in Kenya: the road to community-based animal health service delivery. Overseas Development Institute (ODI) Working Paper 214. ODI, London, 41 pp.