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## **Assessment of Provision of Extension Services and Advocacy on Donkey Health and Welfare in Kenya**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Author JOO designed the study, directed and participated in field data collection, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author JK participated in field data collection and literature review, read and approved the final manuscript.*

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### **ABSTRACT**

**Aim:** To determine type of benefits from keeping donkeys, challenges facing donkey farmers and how to streamline supply of medicines for treatment of donkeys in Kenya.

**Study Design:** A descriptive study conducted in selected regions where donkey welfare projects are implemented and other regions without these projects between the months of May and August, 2018.

**Methodology:** Data collected from donkey owners and users, animal health service providers, regulatory body, and agro-vets using semi-structured and check list questionnaires. A total of 156 questionnaires administered to donkey owners and users and 87 animal health providers.

**Results:** Benefits of keeping donkeys included income obtained from transportation services, sale of surplus donkeys in a herd and hiring them out for a fee, such income are used for paying school fees for children and medical care. On average donkeys contributed about 20% of household incomes from livestock. Donkeys often suffered from myriad of challenges: infestation with endoparasites, wounds, colic, fractures, lameness, pneumonia, babesiosis, trypanosomiasis and zoonoses including tetanus and rabies. Sale volume for medicines used to treat donkey diseases in agro-vets (shops selling agricultural inputs including veterinary drugs) was approximately 15%,

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while percentage of donkey cases treated by animal health providers was about 7% of total caseload. Level of need for response to donkey cases by animal health providers was ranked 4<sup>th</sup> on a priority scale of 1-5. Furthermore, agro-vets did not stock medicines for pain relief. Moreover, differences exist between regions where donkey welfare projects are implemented as compared to other regions on level of knowledge of animal health providers on type of medicines used for treatment of clinical cases in donkeys, requirements for regulation of veterinary practices and types of veterinary providers (P = 0.05).

**Conclusions:** These results support prioritization of training on early recognition for conditions which compromises wellbeing of donkeys and access to pain relief medicines.

**Keywords:** Animal welfare; donkeys; extension services; pain management; Kenya.

## 1. INTRODUCTION

Donkeys are used for a variety of functions ranging from transportation of agricultural products within developing countries, and their use in recreational activities as pets in developed countries [1]. In Kenya, donkey population has been estimated at 2 million based on a previous census report [2]. However, this population estimate may have decreased following the recent increase in number of donkeys traded and slaughtered through local slaughterhouses in Kenya for the growing demand of donkey meat and hides in china where they are used as ingredients for preparation of *ejiao* which is a traditional medicine used by Chinese people. A few studies have investigated diseases and other challenges associated with raising of these working donkeys. For example, based on results from a study designed to investigate prevalence of gastro-intestinal nematodes, gross skin conditions and ectoparasites of donkeys, it was reported that eighty three percent of donkey herds were suffering from nematodiasis [3]. The predisposing factors associated with occurrence of nematodiasis included gender of owner, average age of donkey herd, status of deworming, level of hygiene in holding premises and location of farms. Apart from nematodiasis, the donkeys were infested with ticks: *Rhipicephalus pulchellus* and *Rhipicephalus appendiculatus*, while sampled skin scrapings revealed fungal infections from *Trichophyton*, *Epidermophyton* and *Microsporum* species. According to the report, donkeys owned by women and those kept in "dirty" bomas with no deworming regime had higher risks for nematodiasis. The gastro-intestinal nematodes obtained from donkeys included *Strongylus vulgaris*, *S. edentatus*, *S. equinus*, *Cyanthostomum coronatum*, *C. tetracanthum*, *C. radius*, *Strongyloides* species and *Ascarids*. In addition, donkeys recruited in the study had open wounds, overgrown hooves, alopecia and some

combinations of these gross skin lesions which are indicators of poor welfare standards in the farms that were included in the survey. Kirui et al. [4], in their review on type of responses to challenges of worm infestation in donkeys, argued that due to risk of development of antihelminthic resistance from uncontrolled use of antihelminthic compounds, strategic helminth control should be implemented in donkey herds to prevent build-up of parasites in the environment where donkeys are raised.

Studies have also reported occurrence of infectious diseases of donkey in Kenya. For example, Gichure [5], reported sero-prevalence of African horse sickness at 35% after rainy seasons and 28% during dry seasons in Lari and Kiambu region in central Kenya. The risk factors which were associated with occurrence of increased sero-prevalence of African horse sickness in donkeys included age of donkeys sampled, presence of stream of water near homesteads, sources of purchased donkeys, nature of work donkeys were used for, vaccination status and type of donkey housing. And, Karanja, [6], reported that severity of *Trypanosoma congolense* infection of donkeys was characterised by clinical and pathological presentations which were manifested with reduction in red blood cell counts; while packed cell volume and haemoglobin concentration decreased by 41.6% and 41.4% amongst infected donkeys respectively.

In the Kenyan context, delivery of veterinary services has evolved through different stages since the era of structural adjustment programmes in the late 1980s. According to Okwiri et al. [7], privatization of veterinary services resulted in rapid expansion and growth of private veterinary delivery system in smallholder systems where there was ready market for livestock products including milk and meat products due to high human population

densities in these areas, and presence of a considerable number of wealthier farmers as compared to arid and semi-arid areas where few opportunities for diversification of veterinary services and poor cash flows amongst pastoralists predominated. Community-based animal healthcare workers (CBAHWs) who were facilitated by non-governmental organizations emerged to fill the gap left by inadequate veterinary service delivery system [8,9]. These animal health services delivery systems and agro-vets (shops selling agricultural inputs including veterinary drugs) have faced challenges stemming from lack of proper regulations, including selling of veterinary medicines without proper advice on route of drug administration and correct dosages [10]. However, outlets selling veterinary medicines within the smallholder farming systems, which are properly regulated, are instrumental for supply of veterinary medicines to farmers whose livestock are at high risk of infection, as is evident from a report on role of shops selling veterinary drugs in tsetse-infested area of western Kenya [11]. But recently, the Kenya Veterinary Board which is a regulatory body with a mandate to enforce standards in animal health sector have established mechanisms which aims to rein in errant animal health practitioners to streamline activities within the veterinary services sector.

Within the local context, research on welfare indicators for donkeys including freedom from hunger, fear and distress, discomfort, pain and injury and expression of normal behaviour which are described by the office international des epizootics (OIE) as five fundamental freedoms of animal welfare have attracted low research interest [12]. But globally, studies have investigated donkey welfare challenges. For example, a baseline study in 20 European Union donkey facilities employed "AWIN" a welfare assessment protocol for donkeys, and reported that 25% of donkeys were moderately overweight; 15% presented signs of neglect including overgrown hooves and incorrect hoof trimming, while 18% showed an avoidance reaction to approaching human [13].

This review reveals deficiencies on research in donkey health and welfare in the local context, but which have also been compounded by inherent challenges on delivery of veterinary services to livestock in different production systems where donkeys are raised. For this report, we explored research questions on need

level for equine veterinary clinical interventions; factors determining treatment seeking behaviour for equine, and what share of animal health service providers business comprised equine practice in relation to other animals. The findings are important for mainstreaming supply of essential equine medicines in local veterinary service delivery systems with increased focus from local researchers and policy makers on health and welfare of working donkeys.

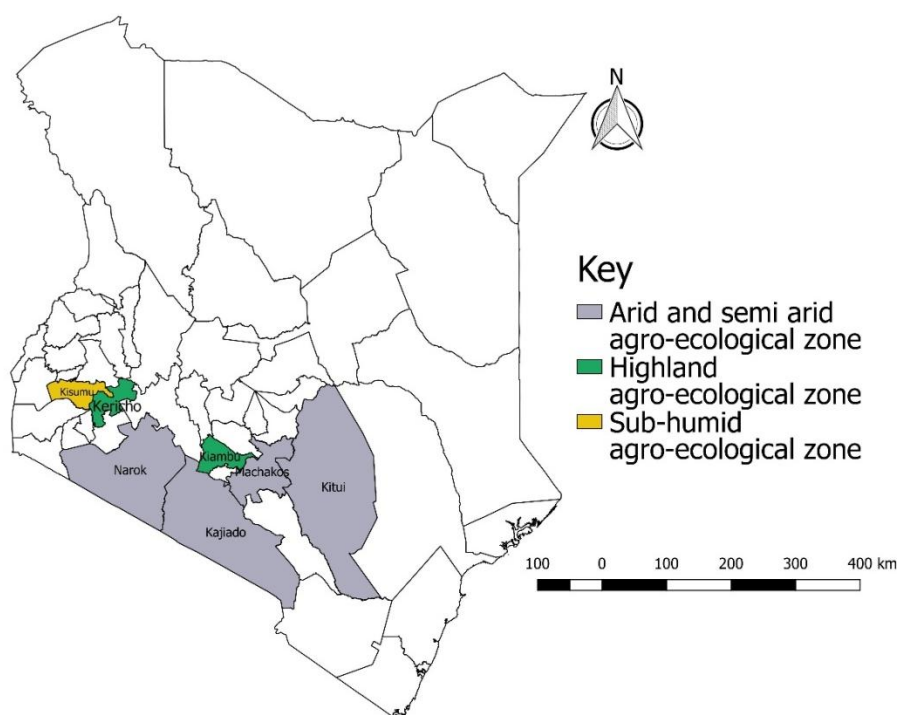
## 2. MATERIALS AND METHODS

### 2.1 Study Design and Area

This was a descriptive study conducted in regions where donkey welfare related projects were implemented by non-governmental organizations supporting donkey welfare campaigns in Kenya, and in other regions where welfare campaigns were not implemented. Field data collection was between the months of May and August, 2018. The study counties where donkey welfare campaigns were implemented included Kitui, Kiambu, Kajiado, Narok, and Kisumu, while Kericho and Machakos were counties where welfare campaigns were not implemented. These counties were purposively selected to represent different production systems: Kitui, Kajiado, Machakos and Narok which are in arid and semi-arid agro-ecosystems, Kiambu and Kericho are located within highland agro-ecological system while Kisumu is within a lowland sub-humid agro-ecological system (Fig. 1).

### 2.2 Selection of Study Units

The units of study included donkey owners and users, animal health service providers and owners of agro-vets (shops selling agricultural inputs). Donkey owners and users were recruited for study by government veterinary officers and local community administrators. The selection of agro-vets and local animal health providers for the study were based on referrals from donkey owners and users where they always purchased donkey medicines and also obtained animal health services for their sick donkeys. According to the national regulatory body for animal health services in Kenya (Kenya Veterinary Board), approximately 50% of agro-vets operating in the country were not registered and licensed to operate, so there was no properly constituted sampling frame to work with on selection of agro-vets and animal health services providers for the study.



**Fig. 1. Map of Kenya showing administrative boundaries and counties where data collection was conducted**

## 2.3 Data Collection

Data was collected using semi- structured questionnaires which were administered to donkey owners and users, owners of agro-vets and animal health service providers. The questions for donkey owners and users included the following items:

- What were the benefits of keeping donkeys?
- What were the challenges faced by donkey owners and users?
- From which agro-vets (shops selling agricultural inputs including veterinary drugs) they purchased veterinary medicines?
- Approximately what number of livestock were kept in the household (cattle, donkey, chicken and sheep and goats)?
- What was the proportion of household income from livestock obtained from donkeys and other livestock?
- Who decided on how to use income from different livestock species?
- Where was treatment for sick donkeys sought as a first option?
- Who paid the veterinary fees for treatment of sick donkeys?

- What was the amount of money donkey owners were willing to pay for treatment of clinical cases of donkeys?

The questions asked to the owners of agro-vet and local animal health services providers included:

- What was the type of business enterprise they operated?
- Was the business registered with a regulatory body (Kenya Veterinary Board)?
- Had the operator or owner been trained on donkey welfare practices?
- Who offered the training services?
- What were the common donkey conditions/problems that owners reported to service providers?
- What were the list of donkey medicines stocked in agro-vets shops?
- What was the percentage share of total sales for medicines used for treatment of donkey cases as compared with other livestock?
- What were the reasons for observed differences in sale volumes?
- How would the observed difference in sale volumes be corrected?

- What was the list of donkey diseases reported to agro-vets and local services providers?
- Which medicines were frequently used for treatment of donkey diseases?
- What was the number of clinical cases of donkey they treated within the last one month preceding the date of interview?
- What was the order of priority for attending to donkey disease conditions as compared to other livestock? (1= high priority; 5 low priority)
- What was the percentage share of number of cases treated for donkeys as compared to other livestock species?
- What were their suggestions on how to correct the observed differences in caseloads for clinical cases of donkeys as compared to other livestock?

Ethical clearance for research was obtained from biosafety, animal use and ethics committee of the Faculty of Veterinary Medicine, University of Nairobi (REF: FVM BAUEC/2018/138).

## 2.4 Data Management and Analysis

Quantitative data were entered in Microsoft excel software while qualitative data were entered in predesigned templates in Microsoft word. The quantitative data were analysed by calculating measures of central tendency and dispersion including mean, range and frequencies, while qualitative data were presented as narrative summaries using framework analytical approach [14]. The frequencies for categorical variables where sample size was considered large ( $n \cdot p > 5$ ) were compared between regions where donkey welfare projects were implemented and other regions using unpaired t-test in a Genstat<sup>R</sup> Statistical package [15] with significance level set at 5%. This is based on the theory of estimation for population proportion for large sample where  $n_1 \cdot \min(p_1, 1-p_1) > 5$ ,  $n_2 \cdot \min(p_2, 1-p_2) > 5$  [16].

## 3. RESULTS

### 3.1 Survey Demographics and Questionnaire Response Rate

Completed questionnaires were obtained from a total of 156 donkey owners and users (Table 1). The highest number of responses was obtained from Kiambu while Machakos had the least number of respondents. A total of 87 animal

health service providers and agro-vet owners were interviewed and these were based on referrals from donkey owners and users on outlets where they often obtained veterinary care and medicines for treatment of donkeys. The respondents included both male and female, but male respondents constituted about 67% of all respondents from regions where donkey welfare projects were implemented, while in the other regions this was 52%. Most of the respondents had a certificate qualification in animal health (63%) for regions with these projects and 56% in other regions, but agro-vet (shops selling agricultural inputs including veterinary drugs) owners constituted 40% of respondents in regions with these projects while in other regions they were 42%. Amongst donkey owners and users, 69% of respondents were of male gender in the regions with welfare projects, while female respondents in other regions constituted 42%. Approximately 86% of the respondents from regions with the welfare projects were donkey owners while in other regions, 18% were donkey users. Of all respondents who owned agro-vets in the regions with donkey welfare projects campaigns, only 60% were registered with Kenya Veterinary Board which was evident by current certificates being held within their business premises and, only 40% were registered in other regions. Less than 50% of respondents had been trained on topics of donkey welfare, and trainings were offered by different organisations which were registered by government to offer advocacy and campaigns for animal welfare.

### 3.2 Description of Benefits and Challenges of Keeping Donkeys

The number of donkeys raised in both study regions averaged two per households, as compared to 5 head of cattle, and 10 chicken. However, the total number of goats and sheep raised within regions with the welfare projects were averagely 40 as compared to only 7 within other regions. According to respondents, from all livestock kept by households, donkey's contribution to household income averaged 20% from the total income from livestock, and both women (61%) and men (59%) had equal control over income from donkeys. A number of benefits from raising donkeys were identified by owners and users. These included income from transportation of various items including water, agricultural products to markets, fodder used for animal feeds, firewood for family use, building materials and manure to be applied in vegetable

and other crop farms. Additionally, donkeys were often hired out for a fee to households that don't keep them, use of donkeys for ploughing crop farms, voluntary sale of donkeys to obtain money for paying school fees and medical care and therefore they provided a source of employment, while other households kept these donkeys for purposes of prestige and other forms of security for farmers keeping cattle against rustlers. A number of challenges were identified to affect donkey ownership. Amongst the challenges with high impact included increased incidences of theft for donkeys, occurrence of diseases, lameness, donkey fights leading to injuries and fractures, open wounds; overworking and overuse of donkeys: donkeys travelling long distances, misuse and cruelty; poor management of donkeys: malnutrition, poor donkey welfare, increase in motor vehicle accidents, poor shelter for donkeys, frequent water shortages, unavailability of pain relief medicines for treatment of donkeys, low interest by veterinarians on donkey health and welfare, increased conflicts with wildlife and donkeys being poor breeders.

### **3.3 Diseases Affecting Donkeys and Medicines used for Their Treatments**

Donkeys were suffering from both infectious and non-infectious diseases according to animal health services providers. The reported cases ranged from rabies, trypanosomiasis, brucellosis, pneumonia and tetanus, foot problems including fractures, foot abscesses, colic, skin diseases, tick and mange infestations, infestation with endoparasites, wounds, emaciation, eye problems, nervous disorders and dystocia. Ivermectin was the mostly stocked and frequently used medicine for donkey by agro-vets and animal health service providers. It was often used for deworming, but other anthelmintics including piperazine and albendazole were occasionally used for deworming these donkeys. Antibiotic sprays were also stocked in agro-vet shops and were used for treatment of open wounds. These were preparations of oxytetracycline which were used together with iodine and hydrogen peroxide for treatment of open and infected wounds. Dexamethasone and xylazine were medicines frequently used for pain management in donkeys, yet flunixin meglumine, meloxicam and phenylbutazone which have superior effects on pain relief were not mentioned because most animal health practitioners and farmers were not aware of these medicines. There were only two

pharmaceutical distributing companies which were registered to import these pain relief veterinary drugs: Meloxicam, phenylbutazone and flunixin meglumine. And, representatives of these companies reported that market share for pain relief medicines in livestock was small, although responsiveness of market demand on price changes for these veterinary drugs were not investigated.

### **3.4 Donkey Health Services Delivery by Animal Health Services Providers**

Sale volume for medicines used for equine treatment comprised about 15% of the total sale volumes for agro-vets within regions with the donkey welfare project campaigns, but this was only 5% in the other regions. Although most animal health services providers reported that they always treated clinical cases of donkey when called upon, animal health service practitioners from regions with these welfare projects were treating on average 7 clinical cases of donkey cases per month, while within other regions this was only 2 clinical cases per month. On a priority scale of 1-5 (1 = high priority and 5 = low priority), the animal health services providers' response to calls for treatment of donkey cases was ranked 4<sup>th</sup> in both regions of study. The level of awareness on medicines used for treatment of equine was low, with only 39% of responders in regions with these welfare campaign projects reporting knowledge of these medicines which could be used for treatment of donkey conditions while in other regions, only 15% reported that they knew medicines used for treatment of donkey treatment. When asked whether they obtained medicines used for treatment of donkey in their local agro-vet shops, only 9% of respondents from regions with these projects reported that they did obtained the medicines, with 7% reporting for other regions. The average amount of fees charged for treatment of a sick donkey in regions with these projects was KSH 1,000 (USD 10), but in other regions this was KSH 500 (USD 5). Animal health service providers who reported that donkey owners and users were willing to pay for treatment of their sick donkeys were 39% in regions with these projects and 42% in other regions. Which was in contrast with reports obtained from donkey owners who reported that majority of them were willing to pay for these animal health services. In both regions of study, the percentage clinical caseloads for donkeys which were treated when compared to other livestock was 7% and 5%, respectively (Table 2).

**Table 1. Distribution and locations of donkey owners, users and animal health service providers interviewed**

County	Sub-counties	Location of sampled donkey owners and users	Animal health providers	Donkey owners and users
Kericho	Ainamoi; Kipkelion West; Kipkelion East	Baraton; Chepseon; Kaplaba; Kericho Township; United Soy; Kapkondor; Londiani	20	25
Kiambu	Kikuyu; Limuru	Kinoo; Nachu; Nderi; Ngecha; Tigoni; Sigona; Muguga	22	30
Kisumu	Kisumu East	Kajulu	4	15
Machakos	Mwala	Wamunyu; Kyawango; Maasi	6	8
Narok	Narok East	Ntulele; Keekonyokie; Ildamat; Mosiro; Nararjie/Enkare	16	29
Kitui	Kitui; Mwingi Central; Mwingi West	Mwingi; Kiomo; Ithumbi; Kalisasi; Kanzanzu	14	23
Kajiado	Kajiado Central; Kajiado North; Kajiado East	Ildamat; Marantawa; Kiserian; Kitengela; Rongai; Nkaimurunya; Fatima; Ngong	5	26
Totals			87	156

**Table 2. Roles of animal health service providers in delivery of donkey health services**

Questions	Category of responses	Areas with campaigns (n = 61)	Other areas (n = 26)	P   T < 0.05
Highest qualification in animal health?	Certificate	57.6%	44%	0.19
	Degree	3%	16%	0.10
	Diploma	39.4%	36%	0.67
	Higher degree	-	4%	-
What is the type of business?	Agro-vets	33.3 %	40%	0.62
	AHAS	63.6%	56%	0.59
	Government	3%	4%	0.90
	Yes	60.6%	36%	0.02**
Are you regulated by Kenya Veterinary Board?	Yes	48.5%	40%	0.35
	Farming Systems	4.8%	-	-
Have you obtained training on donkey welfare?	Donkey Sanctuary	-	11.1%	-
	AWAPH	19.1%	-	-
	KENDAT	33.3%	33.3%	0.87
	Mtunze Punda Daima	42.9%	33.3%	0.48
	KVA	-	11.1%	-
	KSPCA	-	11.1%	-



Questions	Category of responses	Areas with campaigns (n = 61)	Other areas (n = 26)	P  T < 0.05
Are you stocking other donkey medicines?	Yes	9.1%	8%	0.74
Percentage of sales for equine medicines?		15 (0-40) %	5 (0-20) %	-
Do you treat donkey cases?	Yes	75.8%	80%	0.57
How many donkeys were treated in last one month?		7 (0-90)	2 (0-10)	-
What is your priority for treatment of donkey cases?		4 (1-5)	4.2 (1-5)	-
Are you aware of donkey medicines in market?	Yes	39.4%	15.4%	0.01**
Are you able to get all donkey medicines in agro-vets?	Yes	9.1%	7.7%	0.74
What treatment fee is charged in Ksh?		1,000 (100- 3,500)	500 (0-1,500)	-
Are farmers' willingness to pay for treated donkeys?	Yes	Yes – 39.4%	Yes – 42.3%	0.80
What is the percentages caseloads treated by practitioners?	Donkeys	7 (0-40) %	5 (0-20) %	-
	Other livestock	93 (60-100) %	92.5 (20-100) %	-

Keys: Agro-vet – shops selling agricultural inputs and veterinary drugs; AWAPH – Animal Health and Public Health; KSPCA – Kenya Society for the Protection and Care of Animals; KENDAT – Kenya Network for Dissemination of Agricultural Technologies; AHAS – Animal Health Assistants; KVA -Kenya Veterinary Association

Respondents proposed creation of awareness on donkey welfare and health, improved working environment for donkeys, enforcing regulations on donkey welfare and health, educating farmers on donkey management practices, and introduction of free donkey clinics as strategies for increasing sale volumes for medicine used for treatment of donkey conditions within agrovet shops in the regions. In addition, the disparities on clinical caseloads for donkeys would be addressed through educating farmers on donkey welfare, creating awareness on importance and benefits of keeping donkeys, training owners and users on good donkey management practices. While branding of shops with messages on donkeys and increased advertisement of donkey medicines through local mass media by pharmaceutical companies were proposed measures for raising awareness on medicines which could be used for treatment of donkey conditions, including the pain relief medicines.

### **3.5 Description of Roles for Donkey Owners and Users in Delivery of Health Services**

In most farms which were visited during the survey, men decided on need for treatment of sick donkeys in regions where there were donkey welfare project campaigns (80%) and other regions (70%). Within these regions, donkey owners and users often sought treatment for sick donkeys from agro-vet shops, animal health service providers and occasionally they performed self-treatment for sick donkeys. Donkey owners expressed willingness to pay for treatment of sick donkeys, with 80% from regions with these welfare projects and 94% from other regions supporting payments for veterinary services. On average, donkey owners and users were willing to pay KSH 500 (USD 5) per treated clinical case of donkey. When asked whether they readily obtained medicines for treatment of donkey cases in local agro-vets, about 37% of respondents from regions with welfare projects affirmed, while in other regions this was about 30%. The animal health services providers were reportedly reliable when called upon to treat sick donkey cases according to respondents; with 57% from regions with these welfare projects and 71% from other regions reporting that they were reliable when called upon to treat a sick donkey (Table 3).

## **4. DISCUSSION**

Challenges that hamper donkey health and welfare in different farming systems in Kenya and

benefits that accrue to donkey owners and users are highlighted in this report. The identified benefits provide a first step in understanding value of donkey, with contribution to household income from livestock estimated at about 20%. This role of donkeys as a source of income for family is important because, women who are the most deprived members of communities where donkeys are used have control of income from donkeys, besides the income obtained from sale of chicken. And, therefore it offers opportunities for women empowerment especially within the arid and semi-arid regions where donkeys are used for transportation of water for family use. With regard to development effort of the society in general, these benefits contribute in attainment of sustainable development goals across different themes including reduction of hunger, access to clean water and sanitation, poverty reduction, quality healthcare, decent work and economic growth, climate action, responsible consumption and production, gender empowerment, enabling education and support of partnerships for goals [17].

The key challenge reported by donkey owners was increase in incidences of theft for donkeys. From this survey, there were no clear motivation for this increase in incidences of theft cases, but electronic media abound with reports on increase in demand for donkey meat and hides following construction and commissioning of four donkey slaughterhouses in some parts of the Country, and the complex connections with international trade for donkey skin. This threatens donkey population, since the current population estimate based on the last census report was about 2 million. However, at the time of writing this report, Kenyan government had imposed a ban on slaughter and trade on donkey's meat and skin. Apart from the challenge of theft, occurrence of diseases: worm infestations, colic, open wounds, lameness, pneumonia, and fractures were common. The severity of these challenges were further aggravated by lack of drugs which can be used for treatment of pain in donkeys resulting from lameness and injuries. These lack of drugs was manifested from absence of messaging for donkeys on packaging for equine drugs. For drugs which were sold in agro-vets, messaging on packaging materials often focused on horse and not donkeys. Furthermore, the Kenyan law that regulated veterinary profession including prevention of cruelty to animal act- CAP 360 also failed to mention donkey specifically, but the horse was always mentioned [18]. In addition, less than 50% of the animal health service

**Table 3. Role of donkey owners and users in delivery of animal health services**

Question	Category of responses	Areas with campaigns (n = 123)	Other areas (n = 33)	P  T < 0.05
Type of respondents (donkey owner/user)	Owner	86%	82%	0.56
	User	14%	18%	
Level of education of respondents	None formal	6.8%	21.2%	0.05**
	Primary	40.7%	45.5%	0.62
	Secondary	35.6%	18.2%	0.03**
	Certificate	8.5%	-	-
	Diploma	6.8%	12.1%	0.36
	Degree	1.7%	3.0%	0.66
Median number of livestock kept in farms?	Cattle	5 (0 -120)	5 (0 - 43)	-
	Sheep and goats	40 (0 - 800)	6.5 (0 - 42)	-
	Chicken	10 (0 - 400)	10 (0-30)	-
	Donkey	2 (1-12)	2 (0-5)	-
	Dogs and cats	3 (1-5)	2 (0-3)	-
Percentage of income obtained from livestock?	Donkey	20 (0-100)%	20 (0-100)%	-
	Cattle	50 (10-90)%	50 (0-90)%	-
	Sheep and goats	30 (5-70)%	15 (0-30)%	-
	Chicken	10 (0- 40)%	10 (0-50)%	-
Who control income from livestock?	Donkey	Man (39%), woman (61%)	Man (59.4%), woman (40.6%)	-
	Cattle	Man (82.6%), woman (17.4%)	Man (91.7%), woman (8.3%)	-
	Sheep and goats	Man (84.4%), woman (15.6%)	Man (70.6%), woman (29.4%)	-
	Chicken	Man (15%), woman (85%)	Man (23.1%), woman (76.9%)	-
Who decide on treatment of sick donkey?	Hired worker	1.8%	6.7%	0.30
	Woman	17.5%	20%	0.67
	User	-	3.3%	-
	Man	80.7%	70%	0.22
Where do you seek donkey treatment?	Agro-vet	47.4%	24.2%	< 0.001**
	Self-treatment	14.0%	6.1%	0.29
	Service provider	38.6%	69.7%	< 0.001**

Question	Category of responses	Areas with campaigns (n = 123)	Other areas (n = 33)	P  T < 0.05
Who pays for donkey treatment?	Man	79.7%	71.0%	0.39
	Woman	20.3%	19.4%	0.78
	User	-	3.2%	-
	Hired worker	-	6.4%	-
Are you willingness to pay for treatment?	Yes	79.7%	93.9%	< 0.001**
Fee paid for treatment of donkey in KSH?		500 (0 – 8,000)	500 (150- 2,000)	-
Do you obtain medicines for donkey treatment?	Yes	37.3%	30.3%	0.44
Reliability of animal health providers?	Reliable	57.4%	70.6%	0.19

Keys: Exchange rate: 1 USD = KSH 100; Agro-vet – shops selling agricultural inputs and veterinary drugs

providers had obtained some form of training on animal welfare, while treatment of donkey cases comprised only 7% of their clinical caseload; with about 7 clinical cases of donkeys treated per month in areas where welfare campaigns were done and only 2 cases per month in the other regions. And, there was no mention of vaccination campaigns for donkeys against diseases like rabies and tetanus which were reported to occur within the study regions. Furthermore rabies and tetanus are zoonotic diseases and their occurrence within these farming systems places donkey owners and users at a greater risk of exposure to infection, and consequently greater care should be taken in such areas where these zoonotic diseases have been reported [19,20].

There existed significant differences on level of knowledge on types of medicines used for treating health conditions in donkeys and regulation of veterinary practices. In regions where welfare campaigns were done, the animal health services providers had better knowledge on veterinary medicines used for treatment of donkeys in addition to presence of more veterinary practices which were regulated by the KVB. Indeed, from the field survey, just about 60% of respondents who were owners of agro-vets reported that they were registered and licensed by the KVB. The difference in level of knowledge between these regions can be argued to result from increased animal welfare advocacy activities by different stakeholders. But presence of just a few registered veterinary practices present a major challenge in ensuring that livestock farmers get quality products at a fair price, because agro-vets in the arid and semi-arid area are reportedly management by personnel who have no training on animal health [10,21]. However, agro-vet businesses which are properly regulated and well managed are reported to greatly enhance access to veterinary medicines and services to farming communities in Kenya [11,22]. Challenges for access of quality veterinary care in Kenya has been reported in previous studies [7,8,9,21]. Indeed, livestock healthcare within marginalised communities is for the most part delivered by community based animal health workers. However, the untrained personnel are not allowed to provide animal health services by the veterinary surgeons and Para-professional act of 2011 [23]. Nevertheless their role is important for delivery of animal healthcare within marginalised communities [8,24]. As result of these challenges on access for quality veterinary care in most

parts of the country, agro-vets (shops selling agricultural inputs and veterinary drugs) have become vehicles through which Kenya farmers obtain veterinary services and medicines. For example, Bett et al. [11] described how agro-vets were instrumental for increased access to drugs used for treatment of trypanosomiasis in western Kenya. While Highram et al. [22], reported that franchises operating as a social enterprise business model with a network of outlets offered quality veterinary care services in pastoralist regions when compared to other unregulated outlets across rural areas in Kenya.

The study has revealed benefits obtained by donkey owners and users from increased advocacy on donkey health and welfare. But there exist challenges with the supply of pain relief drugs for use in clinical cases of donkeys by established veterinary distribution chains. The proposals by service providers for incorporation of donkey medicines to existing distribution chains through branding of shops with messaging on donkeys and advertising in mass media may achieve some level of success with regard to raising awareness, but most donkey owners may not be able to pay the full market price for pain relief drugs given that majority of donkey keepers are already deprived. Therefore, strategies such as subsidizing retail prices for medicines and concept of revolving fund for drugs, which have successfully been applied in human medicine can be adapted for this purpose [25,26]. Indeed, subsidizing retail price for medicines was successfully implemented for health programmes which included artemisinin-based combination therapy for children [25].

## 5. CONCLUSION

In conclusion, interventions through training of donkey owners have created knowledge base on the need level for donkey health and welfare, but future interventions should focus on sustainability of health and welfare services through creation of demand for health services targeting pain recognition in donkeys amongst owners and users, since these donkeys suffer greater pain when engaged in labour intensive assignments, and targeted training of animal health service providers on use of quality pain relief medicines in animals.

## ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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