Evaluation of the efficacy of knowledge-transfer interventions on the knowledge of working equid owners in Ethiopia

Thesis submitted in accordance with the requirements of the University of Liverpool for the degree of Doctor in Philosophy

by

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Table of Contents

Author's declaration

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

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Evaluation of the efficacy of knowledge-transfer interventions on the knowledge of working equid owners in Ethiopia - Andrew Stringer

It is reported that there are at least eight million working equids in Ethiopia, and their role in the socio-economics of Ethiopia is substantial; however they suffer from prevalent parasitic and infectious disease, and diseases associated with poor management practices. Ethiopia, with its large population of working equids, is ideally placed to benefit from education or extension programmes for the owners and users of equids.

A Participatory Situation Analysis (PSA) was used to identify and prioritise, with owners, the diseases and other health concerns in working equids in sites in central Ethiopia. Forty separate disease and health problems were volunteered by horse and donkey owners. Horse owners volunteered a musculoskeletal syndrome, colic and Epizootic Lymphangitis most frequently, whereas donkey owners volunteered sarcoids, nasal discharge and wounds to occur most frequently. Coughing was volunteered frequently by both horse and donkey owners. The information gathered during this study was used to inform the content of the knowledge-transfer interventions used in a subsequent trial.

A greater understanding of rural farmers' interactions with existing formal and informal information sources could improve the development of appropriate knowledge-transfer pathways. Individual interviews and a Participatory Situation Analysis (PSA) with rural farmers were utilised to gain an understanding of the existing sources of information concerning donkey health and husbandry. These identified 11 sources of information. A cross-sectional study involving 516 randomly selected rural farmers (who owned donkeys) measured their knowledge of a donkey healthcare issue (wounds and wounds management) and other variables relating to information sources. Numerous sources were utilised by owners and the contact with these sources for the most part was on an irregular and needs basis, with the majority of owners revealing that the sources were unreliable with regards to the information they provided on donkey health. Cluster analysis suggested six clusters of individuals based on sources contacted. The median knowledge score of participants increased as the number of information sources contacted increased. Multilevel linear regression models revealed formal education level, cattle ownership, whether a participant gives advice to other donkey owners and washes and cleans wounds on his donkey had a significant effect on the knowledge score.

A cluster-randomised controlled trial was used to evaluate and compare the effectiveness of three knowledge-transfer interventions on knowledge-change about equid health amongst rural Ethiopian working equid users. Groups were randomly allocated to receive either; an audio programme, a village meeting or a diagrammatic handout, all of which addressed identical learning objectives, and were compared to a control group which received no intervention. 516 farmers were randomly selected in 32 randomly selected villages and interventions randomly assigned to villages. Knowledge levels were assessed by questionnaire administration. 504 farmers undertook the short-term follow-up questionnaire (approximately two weeks post-dissemination) and 476 farmers undertook the long-term follow-up questionnaire (approximately six months post-dissemination). All interventions significantly improved the overall 'change in knowledge' score on the questionnaire compared to the control at short-term and long-term follow-up; the diagrammatic handout and the village meeting having a significantly greater impact than the audio programme. There was a significantly greater increase in knowledge with the handout compared to the village meeting at long-term follow-up. Multilevel logistic regression identified a difference in learning across interventions, learning objectives, age and education levels of the participants.

Findings in this thesis should assist in the design and development of effective knowledge-transfer materials for adult learning for rural villagers in low-income countries.

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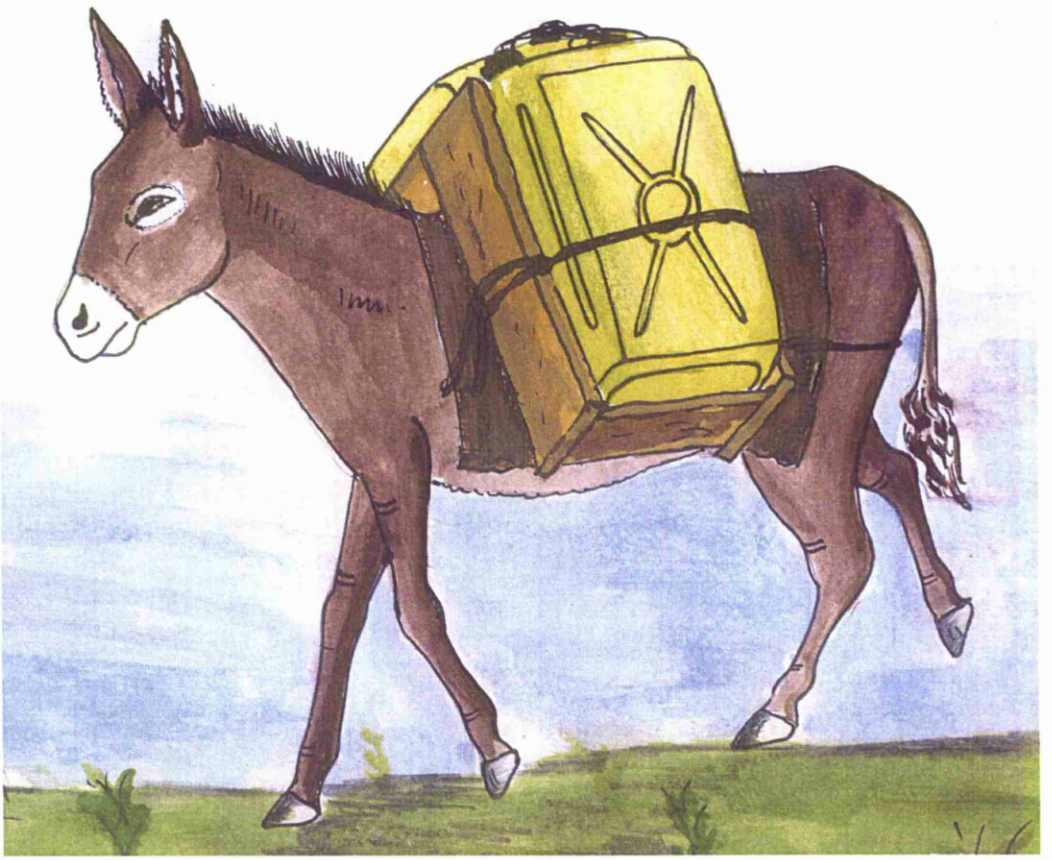


Harree fayyaan, Harree cimtuudha!

A healthy donkey is a hard working donkey!

CHAPTER ONE

General Introduction Part A:

Disease and health considerations of working equids in Ethiopia

Background

Ethiopia has the largest population of working horses, mules and donkeys in Africa and the second largest population in the world behind China. These working equids suffer from low productivity as a result of prevalent parasitic and infectious diseases, and diseases associated with poor management practices compounded by low nutritional standards. This chapter reviews the literature (both peer reviewed and non-peer reviewed) that describes and quantifies disease and health considerations of working equids in Ethiopia. Prioritisation of diseases will help ensure the appropriate direction of resources towards research, education and clinical treatments.

There are estimated to be 2.0 million horses, 0.37 million mules and 5.7 million donkeys working in Ethiopia, the largest population of donkeys in Africa (Anon, 2012). Yet despite the fact that working equids provide a key source of power and are crucial to the functioning of farming systems, they remain absent from food security and agricultural interventions (FAO and The Brooke, 2012). Studies in Ethiopia have shown that the majority of rural households will own donkeys (Marshall and Ali, 1997). Cross breeding has left it difficult to categorise horses into specific groups, however two classifications have been proposed, the Oromo horse and the Dondola horse (Gebreab, 1993). Five types of donkeys have been characterised within Ethiopia: Jimma, Abyssinian, Ogaden, Eritrean and Sennar. Two well known types of mules exist in Ethiopia as well, the Wollo and the Sennar mule (Gebreab, 1993).

Working equids play a substantial role in the livelihoods of an Ethiopia population dependent on subsistence agricultural production for income generation (DFID, 2006; Pearson et al., 2001). One study revealed that the net income associated with equine ownership in Ethiopia was $330 per year, with the income derived from the use of equines accounting for 14% of total income (Admassu and Shiferaw, 2011). Equids are used for the transportation of goods, people and in some areas for agricultural purposes (Garuma et al., 2007; Pearson et al., 2001; Gebreab, 1993) There is a clear division of labour between the species; donkeys are mainly used as pack animals (Gebreab and Fanta, 2004; Kidanmariam, 1997), although a minority are used to pull carts; whilst horses are predominately used as harness animals and for riding (Wilson, 1990). Due to their perceived low social status and their single purpose role within farming systems, few farmers kept more donkeys than were needed to fulfil their immediate work requirements (Tesfaye and Smith, 2000). This

low status has been documented in a number of studies and reports (FAO and The Brooke, 2011; Tesfaye and Smith, 2000; Marshall and Ali, 1997).

The large donkey population has a direct effect on the lives of rural people by reducing the transport burdens of water, fuel wood and goods (Garuma et al., 2007). Although often considered a secondary animal, in relation to oxen, they provide an entry point for assisting women in both domestic responsibilities and income generating activities (Marshall and Ali, 1997). Marshall and Ali (1997) also concluded that donkeys were associated with poverty, and that there was a social stigma attached to using donkeys for certain activities. However, in two of the three study areas the attitude towards donkeys are changing, and they are actually increasing in 'social value' (Marshall and Ali, 1997). In male-headed households, men have more say in the use of the donkeys than their wives. However, in female-headed households, the women have full control over donkey use (Marshall and Ali, 1997). This is similar to the findings in another study in Ethiopia, that also reported that the one who owns and controls the resources (e.g. donkey) also controls the benefits (Pearson et al., 2001). This differs from owning oxen where a female head of household can own oxen but she cannot use them, and the amount of control over the oxen differs between geographical areas and households (Marshall and Ali, 1997).

Farmers in Ethiopia who did not own a donkey had a relatively weak economic base compared to those who owned donkeys, and non donkey owners were also shown to own fewer other livestock (Alemayehu et al., 2000). Over the last five years (2007-2012), the price of a donkey in Ethiopia has increased; this is similar to one study which reported that the price of donkeys had increased as their importance in local livelihood strategies had increased. One reason for this, was that they remain more affordable than oxen, especially as their maintenance costs are low (Marshall and Ali, 1997). Income generating activities with donkeys are usually undertaken by men and they take precedence over domestic work, however women can earn an income from donkey transport in many areas within Ethiopia (Marshall and Ali, 1997). Farmers started to use their donkeys for work when it reached about three to four years of age, and the effective working life in rural areas was estimated to be in the range of 11 to 13 years (Alemayehu et al., 2000). The majority of donkeys rely on grazing to meet their nutritional demands, with some additional supplementation of straw and grain (Asfaw et al., 2000).

Health issues of donkeys were indicated as the primary constraint that affects the reproduction and working capacity of donkeys (Kebede et al., 2000). In one study in Ethiopia, farmers who owned donkeys all shared a common perspective that donkeys received very little care, and health problems were commonly treated using traditional medicine (Marshall and Ali, 1997).

Cart horses in Ethiopia play a significant role in providing a sustainable daily income for people in towns and can generate five times the income earned by daily labour alone. Owners reported using their carthorses for an average of five years after which they were no longer able to work due to disease, weakness from work overload, hoof problems and age (Shelima et al., 2006). Horses, donkeys and mules in Ethiopia all suffer from prevalent parasitic and infectious disease, and diseases associated with poor management practices (Yilma et al., 1990). These contribute to low productivity, the short life span of Ethiopian donkeys (9-13 years) compared to a possible 37-40 years in the UK (Svendsen, 1994) and can cause severe welfare problems (Pritchard et al., 2005). Powell (undated) reported that at least 40% of donkeys in Ethiopia needed some form of veterinary treatment each year. The provision of animal health services to an area has resulted in a positive impact on the health and welfare status of those equids, with higher body condition scores, and a lower incidence of wounds, colic, sarcoids and sudden death reported (Curran et al., 2005). This in turn leads to improved productivity and provides owners with a more reliable income which can improve their livelihoods (Curran et al., 2005).

1. Non Infectious Diseases

1.1 Wounds and Traumatic Injuries

The majority of wounds seen on working equids in Ethiopia are a result of manmade causes (Powell, 2002; Getachew, 1999; Eshete, 2000), in contrast to more developed countries where the majority of wounds are a result of accidents. Harness related wounds have been documented as one of the most prevalent health problems in equids in Ethiopia (Biffa and Woldemeskel, 2006; Gebreab and Fanta, 2006; Shelima et al., 2006; Curran et al., 2005; SPANA, 2005; Yilma et al., 1990; Powell, undated) and this is consistent with literature from other developing countries (Sells et al., 2009; Burn et al., 2007; Aravindan et al., 2006; Pritchard et al., 2005). Wounds was top in a list of conditions associated with both morbidity and mortality (Powell, undated). It was also the most prevalent condition identified in other studies, in both donkeys (Getachew, 1999) and horses (SPANA, 2005;

Getachew et al., undated (a)). Manmade wounds may be associated with poor and improper harnesses and tack, hobbling or tying, overloading and beating (Biffa and Woldemeskel, 2006). One survey of 1648 wounded Ethiopian donkeys found the most common locations were in order of most common: spine, under tail, flank, girth region and distal limb (Powell, undated). The same study also found that the older the donkey and the lower the body condition score, the more likely the donkey to have a wound and/or a back sore (Powell, undated). This is supported by another study that reported that old animals (greater than eight years) were at about five-times greater risk to have a wound than younger animals (Biffa and Woldemeskel, 2006). Studies have shown the prevalence of harness related wound to be as high as 96% in carthorses in individual towns (SPANA, 2005), with another cross-sectional study reporting a prevalence of 100% of 837 horses having a harness sore, 15.7% having an inguinal wound, 7.5% a carpal wound and 5.7% a fetlock wound (Getachew et al., undated (a)). External injuries in donkeys and horses were shown to have a prevalence of 79.4% and 65.4% respectively (Biffa and Woldemeskel, 2006). The most frequent cause of wounds in donkeys was overloading and overworking in donkeys (28.7%), and by improper harness and saddle design in horses (27.9%) (Biffa and Woldemeskel, 2006).

Prevalence figures reported for donkeys examined by one veterinary non-governmental organisation (NGO) - The Donkey Sanctuary over a five-year period, showed that between 16.4-22.6% of donkeys in Ethiopia were affected with back sores. It can be inferred from these figures that one in five donkeys suffer from a back sore (Gebreab and Fanta, 2004). Whilst records from 40,330 clinical cases seen during the period of 1995-1997 by the same charity revealed wounds (due to lack of padding and improper harness or harnessing) accounting for 44% of total conditions (Getachew et al., undated (b)). In another survey of 1648 donkeys in Ethiopia, 34% of donkeys had at least one wound over the year and they were the most significant cause of morbidity in donkeys (Powell, undated). Sores were the most important disease as identified by owners in Ethiopia in an assessment by Kebede et al., (2000), and described as the most serious health problem by owners in another study in Ethiopia (Tesfaye and Curran, 2005). The major cause of these sores was due to inappropriate saddle design, with the sores being worsened through overwork. Approximately 80% of the rural owner and 90% of the urban owners reported that sores frequently occurred on the backs of their donkeys. Wounds in donkeys are much more common in urban areas than rural areas, with 87% of urban donkeys being wounded in any one year compared to 27% of rural donkeys (Powell, undated).

Other accidental wounds on donkeys may be caused by donkey bites, hyenas, car accidents and horn gores (Getachew et al., 2002; Getachew et al., undated (b)). Hyenas are responsible for a significant number of traumatic wounds that occur during the July to October period when donkeys in Ethiopia are often out on lush pasture (Tesfaye et al., 2006). Cases seen by The Donkey Sanctuary in Ethiopia, reveal that it is predominately (89%) donkeys with poor body condition score (1-2) that are affected and that the musculature of the hindquarters accounts for the most frequently (54%) affected area (Tesfaye et al., 2006). One study of 1648 donkeys in Ethiopia showed about 1.4% of the donkeys will be attacked by hyenas, of which about 50% will die (Powell, undated).

The majority of owners (68.5%) continued to use their horse or donkey regardless of the presence and severity of the injury (Biffa and Woldemeskel, 2006), signalling both an obvious and apparent welfare concern but also the significance of these equids to the daily lives of their owners. Efforts have been made to tackle the problem of harness related wounds. The production and trialling of different saddle harness prototypes has been undertaken and assessed with the future aims of distribution on a partial cost recovery basis. Over 80% of donkeys with overt back sores had their wounds healed with the use of a therapeutic saddle (Gebreab and Fanta, 2006).

1.2 Colic

Colic is a common owner reported health concern of working equids in Ethiopia (Shelima et al., 2006; Curran et al., 2005). Curran et al., (2005) reported 59% of owners indicated that their donkey had colic in the previous year, and 72.1% of 267 owners of cart horses reported colic as a major disease constraint (Getachew et al., undated (a)). In another study, 78% of 201 cart horse owners said colic was a health problem of their horses, and the study ranked it as the third most common problem according to owners (Shelima et al., 2006). In a participatory assessment of diseases affecting carthorses, owners ranked colic as the fourth most important disease affecting their horses health (Scantlebury et al., 2010). A retrospective analysis of clinical cases showed that 10.1% of "Gari" mules had suffered from a "colic syndrome" (Eshete, 2000). Colic accounted for 4.1% of cases from the 3376 cart horses which presented to a veterinary clinic in Ethiopia over a two year period (Shelima et al., 2006). Colic was also the disease most commonly treated with herbs (traditional medicines), with 42% of 144 cart horse owners using this treatment option (Shelima et al., 2006). The two commonest causes of colic in donkeys as documented by

clinical case records were tympanic colic and enteroliathiasis/foreign bodies. These accounted for 47% of the colic cases seen (Boija et al., 2006). Anecdotal evidence has suggested potential causes of these colic episodes to be excess feeding on lush pasture, ingestion of plastic bags, sand contaminated feed and intake of low grade roughage and poorly digested feed. Impaction following the ingestion of excessive dry high fibre feed, the residue of 'Teff' (*Eragositis abyssinica*) has been reported, particularly during the harvesting season (Gebreab, 1997).

1.3 Lameness

Studies in other developing countries have shown lameness, gait abnormalities and foot problems to be extremely common in all working equids, and is thought to result from a combination of risks (including traumatic injury, developmental issues, conformation and breed, nutrition, work related concussion on dry hard roads) and poor management practices (Broster et al., 2009; Pritchard et al., 2005). In Ethiopia, clinical records for 9493 donkeys that presented at Donkey Sanctuary clinics, showed that 14.0% had foot problems, 2.6% had mud fever and 2.4% a lameness problem (Getachew et al., 2002). Of the foot problems 27.7% were due to twisted hoof wall or toes, 11.0% had brittle hooves, 7.1% had a hoof crack, whilst other cases included coronitis, puncture wounds of the hoof, thrush and overgrown hooves. Morgan, (2006) documented an overall prevalence of lameness in donkeys of 3.2%, however lameness was more prevalent in the urban population (10.1%) compared to the rural population (2.4%) of donkeys. The donkeys in urban areas suffered from more foot lameness and trauma (road traffic accidents) compared to the rural population which suffering from more hyena and donkey bites (Morgan, 2006). Muluneh, (2007) reported that 88.3% of donkey owners in Ethiopia reported a lameness problem in their donkeys, and physical examination revealed a prevalence of lameness of 11.1%. More than 85% of the overall lameness occurred on the distal limb (Muluneh, 2007).

In a baseline survey of 250 horse taxi owners in several towns in central Ethiopia, over 57% of respondents identified hoof problems as an issue in their horses and staff observed 19% of horses currently had a hoof problem (SPANA, 2005). In a cross-sectional study of 837 cart horses in central Ethiopia, 13% were found to have a lameness problem (Getachew et al., undated (a)). Whilst in another study, 74% of 201 interviewed carthorse owners said lameness was a disease constraint, ranking it fourth out of all disease volunteered (Shelima et al., 2006). The same study also included the prevalence of a number of orthopaedic

conditions diagnosed after examination of 241 carthorses. The prevalence for arthritis, lameness and foot rot were 5.8%, 3.3% and 2.9% respectively (Shelima et al., 2006). Scantlebury et al., (2010) reported that carthorse owners in Ethiopia identified foot abscesses and hoof problems as the second most important disease to affect their equids.

1.4 Ocular disease

Wounds and ocular injuries were recorded as the health concerns of highest incidence in carthorses in the Northern town of Gonder, Ethiopia (SPANA, 2001). One observational study in Ethiopia carried out on 241 carthorses found that on clinical examination, 5.4% of horses had an eye infection (Shelima et al., 2006). Eye problems were identified in 32% of 837 horses in one survey, with greater than 80% of those horses with an eye problem being diagnosed with corneal opacity and lacrimation (Getachew et al., undated (a)). Whilst another survey of 250 carthorses in Ethiopia, found 21% of carthorses had an ophthalmic condition, with greater than 60% of these involving the right eye (SPANA, 2005). This is consistent with another study in Ethiopia that found the overall prevalence of ocular pathology to be 18.8% in 118 carthorses examined in five clinics over a five month period. Of those diagnosed with ocular pathology, 17% had a mild conjunctivitis, 13% had a current problem with the cornea, 2% had a severe eye problem (pus and/or pain) and 63% had no eye remaining (SPANA, 2006). A much larger study of 1049 carthorses in Ethiopia over a one year period (2008-2009), found the prevalence of ocular conditions to be 23.5%, with the prevalence of horses with an abnormality in at least one eye being 43% (although this varied between towns) (Scantlebury et al., 2012). Ocular pathologies of the right eye were over represented, with possible explanations for this asymmetrical distribution including whip use by predominately right-handed drivers and foreign bodies from oncoming road traffic (Scantlebury et al., 2012). The most commonly observed pathologies were either mild eye pathology or end stage disease (with irreversible pathology), with 51.8% had a visual deficit, 30.8% had ocular discharge and 27.1% had ocular pain. Only 55.1% of owners were aware of an ocular problem being present in their horses, and only 1.9% of these horses were presented to the clinic because of an eye problem (Scantlebury et al., 2012).

Ocular pathology was also documented in 5.4% of 9493 donkeys examined in Ethiopia over a two year period (Getachew, 1999). The most common concerns being medial canthus wounds due to fly strike and corneal scars following trauma (Getachew et al., undated (b)).

Abscesses were documented in over 13% of cases seen in one survey with secondary infection of traumatic wounds the main cause (Getachew et al., undated (b)).

1.5 Respiratory disease

Curran et al. (2005) surveyed 200 donkey owners in Ethiopia and the most prevalent health problems encountered were coughing/nasal discharge. Clinical treatment records for The Donkey Sanctuary over a two year period found 2.7% of 9493 working donkeys in Ethiopia had presented for a respiratory problem (Getachew et al., 2002). A wide variety of respiratory diseases have been documented in donkeys and are discussed in one review article (Kalayu, 2003). Pearson et al., (2001) reported that pneumonia in donkeys was one of the three most common diseases as reported by owners in Ethiopia. In a baseline survey of 201 cart horse owners in the mid Rift Valley region of Ethiopia, 79% reported respiratory disease as a major disease constraint, second only to Epizootic Lymphangitis (Shelima et al., 2006). Whilst pneumonia accounted for 13.4% of the 3376 cases presented to a veterinary clinics in Ethiopia over a two year period (Shelima et al., 2006). In a participatory study with carthorse owners by Scantlebury et al., (2010) respiratory disease was ranked as the fifth most important disease in their equids. A survey of 267 carthorse owner/drivers revealed that 58.7 % thought that pneumonia was a major health constraint in their horses (Getachew et al., undated (a)), whilst SPANA, (2005) reported that 47.4% of 250 carthorse owners thought respiratory disease was a problem in their horse. Donkeys were usually presented for treatment with dry coughing, nasal discharge, head and neck lymph node enlargement and associated abnormal lung sounds (Powell, 2002). Drenching pneumonia caused by inhalation of traditional medicines administered by owners was another reason for donkeys being presented for treatment (Powell, 2002). Few studies report a specific aetiology of respiratory disease in working equids and little is known concerning infectious and environment aetiologies of this problem.

2. Infectious Diseases

2.1 Bacterial diseases

In a study of 100 donkeys that had nasopharyngeal swabs taken whilst presenting at a veterinary clinic in Debre Zeit, central Ethiopia, 84% had gram positive isolates recovered whilst 16% had gram negative isolates recovered (Gutema et al., 2009). The three most

commonly identified isolates were; *Streptococcus spp.* (28%), *Corynebacterium spp.* (15%) and *Staph aureus* (13%), with bacteria being recovered at a higher rate in those donkeys with overt signs of respiratory tract disease compared with those apparently healthy donkeys (Gutema et al., 2009). One review commented that most clinical strangles (*S. equi var. equi*) cases admitted to one equine veterinary charity in Ethiopia (The Donkey Sanctuary) were advanced enough to involve the guttural pouch and that the mortality rates amongst young foals was over 50% (Kalayu, 2003). A study of septicaemic horses in Ethiopia showed the main species isolated were *Escherichia coli*, *Staphylococcus aureus* and *Klebsiella pneumoniae* (Biruhtesfa et al., 2007).

Carthorse owners in Ethiopia perceived anthrax to be a health concern to their animals in one baseline survey conducted (SPANA, 2005), whilst anthrax was amongst disorders diagnosed in donkeys at the Debre Zeit (Ethiopia) veterinary clinic (Yilma et al., 1990). It has also been reported to have a seasonal occurrence (increased number of cases in May and June), and in one outbreak the mortality rate in donkeys during that period was 47.1% (Shiferaw, 2004). Anthrax was one of the three most common diseases reported to affect working donkeys by owners in a study in Ethiopia by Pearson et al., (2001). Tetanus cases are seen frequently (Yilma et al., 1990) with a reported fatality of 22% in a retrospective analysis of clinical case records (Boija et al., 2006). Another retrospective study of 45 tetanus cases treated by The Donkey Sanctuary in Ethiopia between 2008 and 2009 revealed a survival rate of 66.3%, with the average time interval between the first clinical signs and recovery being 19.0 (+/-3.5) days (Ayele et al., 2010). In this study an increased number of cases were observed during the long rainy season, between the months of July and September.

2.2 Viral

Whilst viral diseases are without doubt present and are a threat to the health of working equids, little literature exists with regards to the frequency or impact of viral diseases on working equids in Ethiopia. Outbreaks of African Horse Sickness (AHS) have been documented in Ethiopia, these include a report of serotype 6 of the arbovirus (Zeleke et al., 2005) and serotypes 2, 4 and 8 (Aklilu et al., 2012). Previous to these reports, serotype 9 was the predominate serotype found. Studies have shown the seroprevalence of AHS antibodies in donkeys, mules and horses to be 27.4%, 15.5% and 25.9% respectively (Bekele, 2007; Kifleyohannes, 2007). Significant differences in seroprevalence were

observed in different agro-ecological areas, with a higher prevalence being documented in lowland and midland areas compared to highland areas. This has a direct correlation with the ecological distribution of the *Culicoides* vectors (Bekele, 2007; Kifleyohannes, 2007). The use of a monovalent vaccine containing only serotype 9, which does not provide cross-protection against other serotypes has reduced the efficacy of vaccination programmes in Ethiopia (Zeleke et al., 2005).

Both Equine Herpes Virus (EHV-1) and 4 (EHV-4) have been shown to be endemic within central Ethiopia (Duguma, 2007). This cross-sectional survey estimated the seroprevalence of EHV-1 in donkeys, mules and horses to be 22.6%, 14.3% and 21.3% respectively, whilst the seroprevalence of EHV-4 in donkeys, mules and horses was 90.2%, 100.0% and 95.5% respectively. The study concluded that there was strong evidence that higher altitude, increasing age and male sex were associated with increased odds of being seropositive for EHV-4. The presence of Equine Herpes virus (EHV) 1 and 4 has been confirmed in serum samples collected from donkeys in Ethiopia. The prevalence of EHV-4 was as high as 88% from selected sites (Gebreab, 2008). A small study of 121 donkeys in Ethiopia found seropositivity of 85.9%, 0.8% and 20.7 % for EHV-4, West Nile Virus (WNV) and Equine Viral Arteritis (EVA) respectively, whilst mules were 87.3%, 9.5% and 4.8% seropositive for EHV-4, WNV and EVA respectively (Powell, undated). There has also been one recorded outbreak of Asinine Herpesvirus (AHV-3) in Ethiopia with 18 donkeys affected. AHV-3 was isolated from a nasal swab of a donkey with ataxia, anorexia and unilateral facial paralysis. Six donkeys died and twelve donkeys survived after showing milder clinical signs (Kalayu, 2003).

Rabies has been identified in a number of species in Ethiopia including working equids (Okell et al., 2012; Pearson et al., 2001; Fekadu, 1982). In a participatory study of rural farmers by Okell et al., (2012), the relative proportion of mortality in equines due to rabies was 14.8% out of all species studied.

Sarcoidosis is an issue that affects predominately the donkey population in Ethiopia (Yilma et al., 1990; Getachew et al., undated (b)). One study by Getachew, (1999) revealed a 3.4% prevalence out of 9,493 clinically examined donkeys in Ethiopia, with the fibroblastic form of sarcoid being presented most commonly for treatment (Ayele et al., 2006).

2.3 Fungal

Epizootic Lymphangitis (EZL), a contagious dimorphic fungus (*Histoplasma capsulatum var. farcinosum*) is a well documented health concern for working equids in Ethiopia, with studies showing both the mycelial and yeast forms present within the carthorse population (Ameni, 2006; Ameni et al., 2006; Shelima et al., 2006; Ameni and Terefe, 2004; Ameni and Siyoum, 2002; Eshete, 2000; Getachew et al., undated (a)). A comprehensive review article outlines the clinical presentation of the disease, current knowledge on the pathogenesis, epidemiology and options for control (Scantlebury and Reed, 2010). The evaluation of the Histofarcin test (a skin antigen test) for the diagnosis of EZL revealed a sensitivity of 90.3% and a specificity of 69% in disease endemic areas, whilst a specificity of 100% was reported in disease free areas (Ameni et al. 2006).

EZL has severe economic consequences for the cart horse population in Ethiopia, particularly those based in towns between 1500m and 2300m above sea level (Zerfu, 2007; Ameni, 2006; Ameni and Siyoum, 2002). In a study by Aklilu and Zerfu (2010), 77.6% of respondents reported that they were completely dependent on their cart business for subsistence, with 86% of respondents recognising EZL as the primary health problem of their horses. This study also revealed that 55.5% of respondents encountered EZL in their horses at least once in their carting life, and out of those that had encountered it, 51.5% of horses had died. It has been reported that EZL reduced the daily income of owners by 46.1%, with owners being forced to rest their affected horse for an average of 1.7 additional days per week compared to a healthy horse (Aklilu and Zerfu, 2010).

Cross sectional studies have reported the overall prevalence of EZL in Ethiopia to be between 18.8% and 30.1% (Ameni 2006; Ameni and Siyoum 2002; Eshete 2000). A participatory study by Scantlebury et al., (2010) with carthorse owners in nine different regions in Ethiopia identified EZL as the most common disease in their horses (in mid and low land areas). There has also been the first documentation of the cutaneous form of EZL in the donkey species (Powell et al. 2006). Although EZL has been reported in all equid species, traditionally it has been thought that donkeys are less susceptible to infection than horses and mules (Scantlebury and Reed, 2010). Current treatment strategies being employed include oral iodides with complementary ancillary treatment (Aklilu and Zerfu, 2010; Getachew et al. 2006a; Getachew 2004). Full recovery in early cases of the disease were attained in 30 days with sodium iodide and 17 days with potassium iodide (Getachew

et al. 2006a), with Akillu and Zerfu, (2010) reporting iodides being effective in 85% of early cases of EZL. A field trial to assess the effect of Endod (Phytolacca dodecandra) on EZL in horses has also been carried out in Ethiopia (Ameni and Tilahun 2003).

2.4 Parasites

The largest section of the published literature concentrates on parasitic conditions, particularly gastrointestinal helminths. Scant literature exists documenting the effects of protozoa and arthropods, most likely due to the greater number of helminth parasites present and their larger relative importance as pathogens in working equids (Pandey et al. 1994). Helminthiasis has been documented as a significant problem to equids in Ethiopia, many having a polyparasitism problem (Getachew et al., 2008a; Getachew 2006; Fikru et al. 2005; Yoseph et al. 2005; Getachew 1999; Gebreab, 1997; Gebreab et al., 1990; Yilma et al., 1990). The presence of the following parasites have been documented: small and large strongyles, strongyloides, pinworms, ascarides, stomach worms, bots, lungworms, cestodes and liver flukes (Fikru et al. 2005; Yoseph et al. 2005; Gebreab 1997; Pandey et al. 1994; Gebreab et al. 1990; Yilma et al. 1990). The prevalence of strongyle infection in working donkeys in Ethiopia has been reported in the range of 70-100% (Gebreab et al. 1990; Yilma et al. 1990). One study by Getachew et al., (2010a) revealed the following findings from a two year survey into gastrointestinal parasites in working donkeys in Ethiopia:

'Coprological examination revealed 99% strongyle, 80% Fasciola, 51% Parascaris, 30% Gastrodiscus, 11% Strongyloides westeri, 8% cestodes and 2% Oxyuris equi infection prevalence. Over 55% of donkeys had more than 1000 eggs per gram of faeces (epg). Forty two different species of parasites consisting of 33 nematodes, 3 trematodes, 3 cestodes and 3 arthropod larvae were identified from postmortem examined donkeys. Among the nematodes 17 species of Cyathostominae and 7 species of Strongylinae were identified. Other parasites identified include, Habronema muscae, Draschia megastoma, Trichostrongylus axei, Strongyloides westeri, Anoplocephala perfoliata, Anoplocephala magna, Anoplocephaloides (Paranoplocephala) mamillana, Parascaris equorum, Fasciola hepatica, Fasciola gigantica, Gastrodiscus aegyptiacus, Dictyocaulus arnfieldi, Oxyuris equi, Probstmayria vivipara, Gasterophilus intestinalis, Gasterophilus nasalis, Rhinoestrus uzbekistanicus and Setaria equina.'

A cross-sectional survey in Ethiopia to ascertain the prevalence of fasciolosis in donkeys was conducted by Getachew et al., (2010b), the prevalence in coprological samples from

803 donkeys was 44.4%, whilst the prevalence in 112 donkeys at post mortem was 41.9%. Using the same sample of donkeys, Getachew et al., (2008b) reported that the prevalence of the *Parascaris equorum* infection in the donkeys was 51·1% and in the horses 16·2%, and the prevalence in the donkeys examined post-mortem was 55%. In a retrospective study to investigate the cause of rectal prolapse in working donkeys in Ethiopia, Getachew et al., (2012a) identified that 83.6% (n= 177) of the cases were associated with *Gasterophilus nasalis*. The mean and median numbers of *G. nasalis* recovered from the rectum of infected donkeys were 66 and 64, respectively, with a range of 2–195. The efficacy of an oral formulation of praziquantel in the reduction of cestode egg counts and serum antibody level against *Anoplocephala perfoliata* was assessed in 44 donkeys under field conditions. The results of the study demonstrated that praziquantel was highly effective in reducing cestode eggs in donkeys and had an efficacy of more than 99% until week 16. The immunological assay also showed a significant reduction in serum antibody level against in treated donkeys compared to the control group (Getachew et al., 2012b).

Strategic anthelmintic trials on donkeys in Ethiopia have been carried out in a number of studies (Gebreab et al. 1990; Yilma et al. 1990). Yoseph et al. (2005) and Getachew et al. (2008a) have looked at the seasonal variations of the parasite burdens in the central regions of Ethiopia with the highest mean faecal worm egg outputs being recorded during the main rainy season (June to October). Getachew et al. (2008a) suggest that the most economical and effective control of strongyles can be achieved by strategic deworming programmes during the pre-main rainy season (May), ensuring the greatest proportion of the worm population is exposed to anthelmintic and reducing pasture contamination. Mathematical models developed from life cycle of cyathostomins and weather data concluded that dosing biannually would be ideal for controlling worm burdens. However a combination of dosing either annually followed by biannually or biannually followed by every three to four years could also be applied (Getachew et al. 2006b).

Mulugeta et al., (2010) stated that it was much more logical to approach worm control from a preventative rather than therapeutic point of view. The goal in parasite control is not to eradicate but to reduce parasite reproduction and contamination of the environment. Mulugeta et al., (2010) concluded that annual anthelmintic treatment regime at the end of the rainy season would be suitable to control gastrointestinal parasites of working donkeys in mid-lowland Ethiopia.

Ectoparasites were found in one cross sectional survey in Ethiopia to be prevalent in over 14% of cases (Getachew et al. undated (b)). The major ectoparasites present were ticks (*Amblyoma, Rhipecephalus, Boophilus and Hyalomma spp.*) and lice (*Haematopinus asini* and *Damalina equi spp.*). Mixed infection was a common feature of these cases. Infestation with mites (*Psoroptes equi* and *Sarcoptes equi*) were not common (Getachew et al. undated (b)). Of the 9493 donkeys in Ethiopia examined over a year period by one charity (The Donkey Sanctuary), 35% had ticks, 22% had lice and 0.3% had mites (Getachew, 1999). The dynamics of tick species showed a gradual increase in numbers up to the months of February and an abrupt rise in the months of March and April, coinciding with the onset of the short rainy season (Gebreab, 1998). A cross-sectional study was conducted to determine the species composition and prevalence of ixodid ticks infesting horses in three agro ecological zones in central Ethiopia (Kumsa et al., (2012). A total of 1,168 horses were examined for tick infestation, with an overall prevalence of 39% recorded. A total of 917 adult ticks were collected from infested horses. *Amblyomma, Boophilus, Rhipicephalus,and Hyalomma* genera with the respective prevalence of 3.2%, 1.8%, 29.2%, and 4.7% were identified. In the study, *Rhipicephalus evertsi evertsi* was encountered with the highest prevalence (15.8%) whereas *Amblyomma gemma* was with lowest prevalence (1.5%). Donkeys in Ethiopia have also been shown to be serum positive for the protozoan organisms *Babesia equi* and *Babesia caballi* (Gebreab, 2008).

The presence of *Trypanosoma equiperdum* has been studied in the provinces of Arsi and Bale, using enzyme linked immunosorbent assays (ELISAs) for the detection of both the trypanosomal antigen and antibody (Alemu et al. 1997). The study revealed that the seroprevalence increased with the severity of the observed clinical signs and that there was a positive correlation between the presence of circulating trypanosomal antigen and clinical evidence of infection. As a result of the unrestricted movement of equids throughout the country, and the large population of horses, it is likely that dourine (the clinical syndrome for equine trypanosomiasis) may be more widespread than is currently realised. Serological screening of 646 horses in the Arsi-Bale highlands of Ethiopia showed a seroprevalence of 28%, 25% and 19% for card agglutination test for *Trypanosoma evansi*, LATEX and enzyme-linked immunosorbent assay (ELISA), respectively (Hagos et al. 2009). Different characteristic signs of dourine were observed between sexes, mares showing vaginal oedema, discharge and presence of depigmented scars of external genitalia and stallions showing oedema of scrotum and prepuce, discharge and ulceration of genital

mucosa. The presence of drug resistant *Trypanosoma congolense* in naturally infected donkeys has also been documented in Ethiopia (Assefa and Abebe, 2001).

Conclusion

It is clear that the health, welfare and productivity of working equids in Ethiopia are affected by a variety of diseases of infectious and non–infectious origin. However, prioritising areas for future intervention is difficult due to lack of data on the epidemiology and impact of many diseases. Furthermore, many of the previous studies are likely to have biased prevalence estimates for disease and health prevalences of working equids in Ethiopia as a result of: use of inappropriate sampling methodologies, inadequate sample sizes, responder and observer biases and poor specification of target population leading to inappropriate generalisabilty of conclusions

From the literature review it can be concluded that there are differences in disease prevalence based on location (e.g. urban or rural), climatic season and the species of equid. It would appear that both horses and donkeys suffer particulary from wounds (predominately caused by inappropriate harness and tack), colic, lameness (more prevalent for donkeys in urban locations than in rural locations) and respiratory disease (with horses particularly suffering from African Horses Sickness in low and midland areas). Horses appear to be more susceptible to ocular problems and Epizootic Lympahngitis.

In many cases there may be a discrepancy between the importance of a disease as perceived by working equid owners and those that are either the most common or deemed most important by experts and veterinarians. Further, despite both the frequency and importance of some diseases; e.g. respiratory disease, lameness and ocular problems, there is lack of knowledge regarding the true aetiology. This makes development of appropriate interventions difficult. Hence further research is needed before advances in preventive health or treatment can be made.

CHAPTER ONE

General Introduction Part B:

Extension, education and knowledge-transfer

Background

Extension, education and knowledge-transfer are intrinsically linked in the lives of rural Ethiopian farmers (many of whom own working equids). Many individuals living within rural communities in Sub-Saharan Africa will often have had limited access to formal schooling and many will be illiterate. These factors will influence the methods by which new and important information and knowledge can be communicated to individuals and communities. New information and knowledge can be vital in helping in poverty alleviation, improving agricultural productivity and improving the health and welfare of animals, however there are few studies evaluating the efficacy of animal health knowledge-transfer interventions on farmers in Africa. This chapter reviews the literature surrounding extension, education and knowledge transfer.

1. Extension

There has been some confusion over a definition for the word 'extension'. In many countries (both developed and less developed), knowledge transfer and dissemination about agriculture (both livestock and crop systems) is referred to as 'extension' (Bell, 2002). Another definition given by van den Ban and Hawkins (1996) is that *'extension involves the conscious use of communication of information to help people form sound opinions and make good decisions'*. Extension has been suggested as a solution to help individuals and communities overcome barriers which are stopping them achieving their goals (van den Ban and Hawkins, 1996). Barriers for individuals could include a lack of adequate knowledge or insight to recognise their problems. An individual's current knowledge may be based upon incorrect knowledge as a result of limited experience, upbringing or other cultural factors (van den Ban and Hawkins, 1996). However, the valuable knowledge which resides with farmers, and which has been gathered over generations is often referred to as indigenous knowledge. In many cases this is neglected by researchers and during the extension process, although this information can be important for developing farming systems using recommendations that are location and context specific (van den Ban and Hawkins, 1996). Other barriers described by van den Ban and Hawkins (1996) include motivation (a lack of motivation to behave in a certain way, maybe as a result of the desired change in behaviour conflicting with other motives), resources (a lack of essential resources), insight (a lack of insight) and an insight into power (lacking an insight into community power relations).

Extension can therefore be seen as a process which helps individuals to analyse their present situation, identify problems, acquire specific knowledge related to specific problems, make a responsible choice (optimal for the individual), and increase motivation to implement choices (van den Ban and Hawkins, 1996). Extension is concerned not just with the physical and economic achievements but also with the development of people themselves. It is a process of working with people to improve their livelihoods (Oakley and Garforth, 1985). Extension can occur through many channels, these include: extension agents (Adolwa et al., 2012; Oakley and Garforth, 1985), visual aids (Bell et al., 2005; Feil et al., 1997; Harford and Baird, 1997; Linney, 1995), group meetings (Davis et al., 2004; Mitchell et al., 2001; Seboka and Deressa, 1999; Marsh et al., 1996), video (Bell et al. 2005; Kelly et al., 2003; Sweat et al., 2003; Eaden et al., 2002; Torabi et al., 2000; Yuan et al., 2000), radio (Moussa et al., 2011; Chapman et al., 2003; Egbule and Njoku, 2001; de Silva and Garforth, 1997), information communication technology (ICT) (Panir, 2011; Ramkumar et al., 2007) and mobile technology (Madder et al., 2012). A large number of studies have assessed African farmers knowledge of disease and health problems of their animals (Datiko et al., 2012; Holt et al. 2011; Grace et al., 2009; Tesfaye and Curran, 2005), however there are few studies evaluating the efficacy of animal health knowledge-transfer interventions on farmers in Africa (Bell et al., 2005).

Oakley and Garforth (1985) described the role of the extension agent as being *'responsible for providing the knowledge and information that will enable a farmer to understand and make a decision about a particular innovation, and then for communicating that knowledge to the farmer. In this role, the agent is seen as a vehicle of knowledge, usually of a technical nature, and as a teacher who instructs farmers in the use of this knowledge'*. Extension agents are usually formally trained individuals who are provided with technical information which they must communicate to individuals and communities.

Four main elements can be identified within the process of extension: knowledge and skills, technical advice and information, farmers' organisation, and motivation and self-confidence (Oakley and Garforth, 1985). The transfer of knowledge and skills is an important extension activity, along with the provision of advice and information to assist farmers making decisions. As well as knowledge, information and technical advice, farmers also need organisation to help represent their interests and to give them a means for taking collective action (Oakley and Garforth, 1985). One of the main constraints to development that many farmers face is isolation, and extension can help to motivate and

working closely with farmers, build self confidence and encourage them to take the initiative (Oakley and Garforth, 1985).

Extension may produce conflicts between the interests of different parties (van den Ban and Hawkins, 1996). Potential conflict can occur when the interests of the extension organisation differ from the interests of the client. The only power an extension agent has to influence a potential recipient is the confidence the recipients have in the extension agents' competence to give good advice and their belief that the extension agent will give advice to help the recipient achieve their goals (van den Ban and Hawkins, 1996). The lack of, or inappropriate use of extension material is often a major factor limiting the individuals who work in extension success in working with villagers (Linney, 1995). In Africa, agricultural research has developed many techniques to improve crop and livestock production, and post-harvest handling, but many of those innovations or techniques do not reach farmers and therefore remain unutilised as a result of inadequate extension programmes (Moussa et al., 2011).

The concept of an Agricultural Knowledge and Information System (AKIS) is useful when we consider the ways in which farmers are supported by knowledge and information (van den Ban and Hawkins, 1996). Agricultural knowledge and information systems (AKIS) can be defined as: *'The persons, networks and institutions, and the interfaces and linkages between them, which engage in or manage the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilisation of knowledge and information, and which potentially work synergistically to improve the goodness of fit between knowledge and environment, and the technology used in agriculture'* (Roling and Engel 1991, cited by van den Ban and Hawkins 1996[1]). The theory underlying AKIS is that individuals use many different sources for information and to obtain knowledge, and that AKIS is one way to understand these networks and linkages (van den Ban and Hawkins, 1996).

Agricultural extension systems have shifted to more participatory approaches relatively recently, with a move away from many of the early methods using the top-down approach, which often ignored both local problems and the farmers' existing knowledge and skills (Chapman et al., 2003). A participatory approach requires a shift in roles from teacher to facilitator for the extension agent (Hagmann et al., 1996). Various agricultural research and

[1] Due to certain sources being inaccessible, or existing only in the unpublished literature, a number of references in this thesis are cited by citing other authors who have quoted the original source.

development projects have used participatory approaches, such as Farmer Field Schools (FFS) and Participatory Learning and Action Research (PLAR) to engage farmers, support adult education and farmer experimentation, and allow them to develop their own conclusions. (Nederlof and Odonkor 2006, cited by Zossou et al. 2009). Individuals may be educated in two ways; they may be taught how to solve specific problems, or they can be taught the process of problem solving (van den Ban and Hawkins, 1996). The success of any sustainable development programme is largely determined by the level of participation of farmers (Axinn 1997, cited by Zossou et al. 2009). One study stated that prior exposure to technical information also plays an important role in increasing the probability of adopting technology, and that if previous extension contact was successful, farmers develop more trust in new technology (Moussa et al., 2011)

Not all farmers in one area are the same and farmers will have different problems. Different groups need to be identified and different programmes will have to be developed appropriate to each group (Oakley and Garforth, 1985). Much extension effort has previously been concentrated on the progressive farmer who was expected to spread new ideas to others. This may not always work, as progressive farmers often have more land, are more educated and are usually involved in the marketing of their produce and therefore may have different problems. Therefore, the smaller and poorer farmers may need particular attention, as they may lack the basic resources needed to become involved in extension activities (Oakley and Garforth, 1985). The extension agent's role can be seen as an educational one. It is therefore important to remember that farmers may already have a great deal of indigenous knowledge and that extension must build on this (Oakley and Garforth, 1985).

2. Extension and education considerations

2.1 Education in Ethiopia

Within Ethiopia there is a well established education sector, with both a formal and non-formal education system in place (Bulder, 2007). Pupils can start attending school from the age of seven in the formal education system. Initially, pupils attend primary school (Grade 1-8), from the ages of seven until 15, upon which they may continue their studies in secondary school (Grade 9-10) for the ages of 15-19 (Bulder, 2007). Following secondary school education, there is the option to continue into higher education institutions

(Technical and Vocational Education Training Colleges (TVET), Colleges and Universities (Bulder, 2007). Teaching in primary and secondary schools is carried out in the regional languages, with English being taught as a foreign language. There are no fees charged for attending government schools, however students must provide their own books and writing instruments. Many schools also require children to have uniforms and footwear, both of these are not free or provided (Bulder, 2007).

There is currently an adult and non-formal education programme in existence within Ethiopia that has three components: firstly, a programme for children aged seven to 14 who are not in school; secondly, literacy programmes for those youths and adults older than 15 and thirdly, a basic skills training for youths and adults in community skills training centres (Bulder, 2007). Amongst older adults, some may have received a basic adult education programme (literacy programme) under previous political and military regimes. In November 1955, Emperor Haile Silasse issued a proclamation declaring, 'we change every illiterate Ethiopian between the ages of eighteen and fifty....to know Amharic reading, writing, either at government schools or private' (Richard and Bernard 1974, cited by Molla 2009). With the ending of the imperial rule in 1974, the military government continued to try and eradicate illiteracy in the country, using initiatives such as the National Literacy Campaign (Molla, 2009). This program ran from 1979 until 1989 and reached over 22 million individuals, increasing the literacy level to 83.2% (Molla, 2009). With the downfall of the military regime in 1991, the new government introduced a new Education and Training Policy and continued to work to eradicate illiteracy (MoE 1994, cited by Molla 2009).

Although all children should have access to a school education, the reality is that many do not attend. One survey in 2002 (CSA Child Labour Survey, cited by Bulder 2007), found that 74.3% of children in urban areas attended formal schooling, whilst only 27.2% in rural areas attended and that only half of all children were attending a secondary school, (Bulder, 2007). Another report stated that in 1992, approximately four out of five primary school children were out of school, this had reduced to three out of five by 1999, and in 2008 the figure stood at one in five (UNESCO Institute for Statistics 2010, cited by Engel and Rose 2011). Some of the main reasons for not attending school were given as: children were too young, they were needed to help with household chores, a school was not available to them, they were needed to generate household income and parents could not afford schooling (Bulder, 2007). Weir (1998), cited by Weir and Knight (2000) showed that

a primary reason many people (in rural Ethiopia) gave for never attending school, or for leaving school early was to help with farm and household activities.

The situation is improving, with access to education in Ethiopia increasingly significantly: approximately three million pupils were in primary school in 1994/95, however, this number increased by over 500%. to 15.5 million pupils in 2008/9, (MoE 2010, cited by Engel and Rose 2011). This has largely been the result of a sustained government-led effort, backed up by a substantial increase in the national education expenditure (Engel and Rose, 2011).

Schooling (in rural Ethiopia) has been shown to provide substantial benefits by increasing farm output (Weir and Knight, 2000), with one study reporting that a minimum of four years of primary schooling was required to have a significant effect on farm productivity (Weir, 1999). The same study found that household-level education is important to the timing of adoption of innovations. Educated farmers are often early innovators, providing an example for less educated farmers to copy, and are also better able to copy those who innovate first, enhancing the diffusion of new technologies (Weir and Knight, 2000). A study by Jolliffe (1997) concluded that the maximum or average level of education within a household (compared to head-of-household education level) is a better explanatory variable of household income.

2.2 Adult learning

In the early 1970s the concept of andragogy was introduced, that adult and children learn differently (Knowles et al., 2012). It is proposed that adults are sometimes taught like children because education methods utilised are based on child learning theories (Knowles et al., 2012). It is therefore important that methodologies utilised in adult education programmes take into account any differences. Andragogy is a core set of adult learning principles. The six principles of andragogy in practice, as defined by Knowles et al., (2012) are: 1) the learner's need to know (adults need to know the reason for learning something – what, why, how?), 2) self-concept of the learner (adults need to be responsible for their decisions in education), 3) prior experience of the learner (experience, including previous error, provided the basis for learning activities), 4) readiness to learn (adults are more invested in learning subjects that have immediate relevance to their work or personal lives), 5) orientation to learning (adult learning is problem centred rather than content

centred) and 6) motivation to learn (adults respond better to internal rather than external motivators). Andragogy works best in practice when it is adapted to fit learners and the learning situation (Knowles et al., 2012). Adults tend to learn best when there is an actual need for them to know the information presented, and are more receptive when the material it is directly applicable to their situation (Bessoff 1995, cited by Bell 2002).

It is important to make the distinction between education and learning. Knowles et al., (2012) define education as an *'activity undertaken or initiated by one or more change agents that is designed to effect changes in the knowledge, skill, and attitudes of individuals, groups or communities'*. However, defining learning is more complicated and differs between theories. Education emphasizes the educator (the agent of change), whilst learning, emphasizes the person in whom the change occurs or is expected to occur (Knowles et al., 2012). One definition of learning is that: *'learning is the act or process by which behavioural change, knowledge, skills, and attitudes are acquired'* (Boyd et al. 1980, cited by Knowles et al., 2012). Learning and adoption occur in stages and different types of learning are involved in extension. Five steps can be identified in the process of accepting a new idea: 1) Awareness – learning the existence of an idea, 2) Interest – developing an interest in the idea and seeking more information about it, 3) Evaluation – considering how the idea affects the farmer, 4) Trial – deciding to try the idea on a small scale and 5) Adoption – once convinced by the trail, accepting the idea fully (Oakley and Garforth, 1985).

2.3 Knowledge

Knowledge plays an important role in decreasing poverty among farmers by increasing their ability to use human and social capital to form sound opinions and make good decisions (van den Ban, 2002). Many programmes have relied on the transfer of knowledge in a hope that this will modify behaviour. It has been suggested however, that knowledge alone is inadequate in modifying behaviour, and that there are four components to instigate change: knowledge acquisition, skills development, attitudes development and motivational support (Mitchell et al., 2001).

Van den Ban (2002) states that to decrease poverty amongst farmers an increase in productivity is required. In order to increase productivity much knowledge is needed, not only amongst farmers, but also in institutions supporting agricultural development. Wolfensohn 1997, cited by van den Ban (2002) states that *'Knowledge is now as, if not*

more, important a factor in development, and this trend is to intensify.' One cause for low agricultural productivity has been stated as the low education level of farmers and lack of access to new knowledge developed by farmers, researchers or agri-business companies (van den Ban 2002). A study in India investigating factors that influenced the knowledge level of farmers found that the main factors which influenced their knowledge level were farming experience and economic motivation (Krishnakumar et al., 2000). Other factors shown to have a positive association with knowledge level included age, education, social participation, mass media exposure and extension agency contact (Krishnakumar et al., 2000). It has been shown that three or four separate interactions with relevant information are required for a new knowledge construct to be created, and that during that period, knowledge is held in the working memory before being integrated with other relevant information and background knowledge (Nuthall 1999, cited by Bell 2002). Studies have also shown that learning is enhanced when both visual and verbal information about a subject are presented, and is further enhanced when these two forms of information are presented simultaneously (Mayer, 1999). Criteria that are considered important when utilising knowledge-transfer interventions include, reach and accessibility, acceptability, understanding of the message and message retention (Bell, 2002). It has been suggested that messages presented in several different formats can enhance learning, and that multiple methods may work synergistically to reinforce messages and overcome weaknesses in individual methods (Mitchell et al., 2001).

The animals of the poor are particularly vulnerable to diseases due to many reasons including lack of knowledge about their management and control, and lack of access to appropriate resources and input to improve animal health and productivity (Perry et al., 2002).

2.4 Literacy

The literacy ability and general reading culture of the intended target population is an important consideration if knowledge-transfer methods involving text (e.g. books, leaflets or handouts) are going to be utilised (Mitchell et al., 2001). Within Ethiopia, literacy in youths (15-24 years old) was at 61% for the 2000-2004 period, with adult literacy (greater than 15 years of age) at 45.2% for the same period (Bulder, 2007). One study concluded that there was a direct correlation between the duration of a literacy course and the skill level reached and retained (Roy and Kapoor 1975, cited by Comings 1995). Studies that

look at literacy skills gained in primary school also indicate that duration of instruction is a key determinant (Comings, 1995). The literacy ability of any intended recipients of an extension programme involving written materials (text) must be considered to ensure the programme is effective (Oakley and Garforth, 1985). The use of visual images is not the solution for all situations where illiteracy is a problem, as visual illiteracy (discussed in the next section) may be as common as actual illiteracy in some setting (Harford and Baird, 1997; Linney, 1995).

The literature on adult literacy in developing countries contains many references to the phenomenon of relapse into illiteracy (Comings 1995), with the assumption being that literacy skills will be lost as there is nothing readers can practice their skills on, and therefore post-literacy programs are needed to stop this relapse. Relapse may be related to the duration of instruction rather than either mode of instruction (primary school or adult education programme) or availability of post-literacy programmes (Comings, 1995).

2.5 Visual Literacy

Visual literacy relates to the ability of an individual to accurately understand and interpret an image presented to them (Linney, 1995). Common difficulties associated with visual literacy include a failure to understand perspective, or pictorial conventions such as scale, size, movement and sequences of pictures (Linney, 1995; McBean, 1989; Byram and Garforth, 1980). There is a commonly reported shortage of educational pictures and visual resources in many developing countries (particularly in rural areas), and especially in classrooms (Linney, 1995). Even those that have attended school may not have seen pictures, especially if they have not had access to any printed resources (Harford and Baird, 1997). Lack of familiarity with pictures or printed paper has serious implications for those set the task of communicating with non-literate rural families (McBean, 1989). The result of limited exposure to visual images during school education (and later in adult life) means that opportunities to learn how to understand and interpret images are very limited (Linney, 1995). Previous literature has shown that many people are not visually literate and are therefore unfamiliar in interpreting images, especially in countries with low literacy levels (Harford and Baird, 1997; Linney, 1995). Teaching of the elements of picture understanding such as perspective, action, direction and sequence will assist individuals in the understanding of visual images (McBean, 1989).

A study in Nepal showed that simple drawings of familiar objects which omitted superfluous or confusing detail were recognised by approximately 72% of adult villagers who had not attended school (Haaland and Fussel 1976, cited by McBean 1989). This is supported by another study in Zambia into visual literacy which found that an absence of confusing background detail proved important in increasing visual understanding (Fuglesang 1973, cited by McBean 1989). Visual illiteracy is often ignored in medical and health education, consequently communication and education fail because some target groups are unable to interpret messages correctly (Hugo and Skibbe, 1991). One study which looked at whether illiterate women could interpret instruction illustrations on breastfeeding, revealed that only 9% of women could correctly identify both simplified and detailed black and white illustrations, whereas 66% were able to identify colour pictures (Hugo and Skibbe, 1991).

Materials for communicating health messages often adopt instructional rather than educational approaches. The latter requires more imaginative and creative interpretations. Increased visual literacy provides opportunities for greater variety in the portrayal of health messages, hence the emphasis given to features such as sequence, emotion and motion (McBean, 1988). Development communicators have generally been content to accept that it is sufficient for an illustration to be understood by respondents rather than also questioning whether it attracts or influences them (McBean, 1989). McBean (1989) highlights the importance of exposure to visuals as the single most important factor in determining understanding, and suggests that drawing the attention of rural people to illustrations, and helping them to understand them, can swiftly raise their level of visual literacy and therefore increase the likely impact of other illustrations they encounter. This is supported by Stokes (2001), who suggests that using visuals in teaching results in a greater degree of learning.

3. Education and Extension Methodologies

There are a variety of methodologies available for use in the transfer of knowledge and information to individuals and communities. These include more traditional (didactic) approaches such as formal lectures and tutorials, the use of knowledge-transfer interventions (including handouts, posters, radio and video programmes), through to participatory communication approaches (including famer field schools, village meetings

and group discussions). Informal methodologies also exist, including peer learning (through discussions and observations of friends and neighbours).

Mass media are those channels of communications which can expose larger numbers of people to the same information at the same time. The benefit of mass media to extension services is the high speed and low cost in which information can be communicated to people over a wide area (Oakley and Garforth, 1985). There are some disadvantages to the use of mass media as an extension approach. It is difficult for this approach to offer personal advice and support, teach practical skills or answer questions and queries (Oakley and Garforth, 1985). Their role is suited for tasks including: spreading awareness of new ideas and creating interest, giving timely warnings about situations such as disease outbreaks, multiplying the impact of extension activities and reinforcing or repeating information and advice (Oakley and Garforth, 1985). Mass media messages are short-lived and the audience may pay attention for only a short time. Therefore information provided should be simple, repeated, structured and coordinated (Oakley and Garforth, 1985). Mass media messages need to be pretested before widespread use (Oakley and Garforth, 1985)

Printed media can combine words, pictures and diagrams to convey accurate and clear information. This information can be viewed for as long as the viewer wishes and be referred to many times, and makes them ideal as permanent reminders of extension messages (Oakley and Garforth, 1985). Examples of printed media include posters and leaflets or handouts. However, leaflets were used in one study by Mitchell et al. (2001) with questionable success despite widespread circulation and recognition. A number of reasons were suggested for this, including lack of interest in leaflet, inability to ask questions and clarify misunderstandings, poor literacy and lack of a reading culture within the community (Mitchell et al., 2001). Posters are useful for raising awareness about events and for reinforcing messages that farmers receive through other media (Oakley and Garforth, 1985). Leaflets and handouts can summarise the main points of a talk or demonstration, or provide detailed information that would not be remembered simply by hearing it (Oakley and Garforth, 1985). A randomised controlled trial by Bell et al. (2005) demonstrated the effectiveness of handouts in changing the knowledge of smallholder farmers in Tanzania.

Traditional forms of entertainment can also be used as extension media. Songs, dances and plays can convey information in an interesting and alternative way (Mitchell et al., 2001;

Oakley and Garforth, 1985). They cater to local situations and can deal with responses from the audience, and are especially useful in situations where literacy levels are low (Oakley and Garforth, 1985). Harvey et al. (2000) demonstrated that a drama education programme had a positive effect on the attitudes and knowledge of school children in South Africa with respect to HIV/AIDS.

Other extension methods that an agent may wish to use are meeting on a one-to-one basis with farmers or bringing farmers together. Both of these methods involve the agent being in a face-to-face relationship with the farmer, and this relationship should be one of mutual confidence and respect (Oakley and Garforth, 1985). Individual meetings with farmers are probably the most universally used extension method in both developed and developing countries and can take a number of forms, including farm visits (Oakley and Garforth, 1985). There are a number of advantages to the group method of extension: coverage (greater extension coverage), learning environment (more reflective learning environment in which farmers can listen, discuss and decide upon involvement in the extension activity and action (the group method brings together farmers with similar problems) (Oakley and Garforth, 1985). Community educators (CE) were utilised in a study by Mitchell et al. (2001). These were individuals who had been selected from the community and had received training about HIV/AIDS. In this study the CE were shown to be an effective method of knowledge dissemination, and the didactic method of teaching used was not seen as a problem due to target population being accustomed to this traditional method of teaching (Mitchell et al., 2001). Community Animal Health Workers (CAHWs) have also been utilised in Africa to disseminate information alongside the provision of veterinary services such as vaccination and disease surveillance programmes (Catley et al., 2002; Catley and Leyland, 2002; Leyland and Catley, 2002). CAHWs often act as frontline service providers in areas where veterinarians and other service providers are unwilling to work (Catley and Leyland, 2002).

3.1 Visual Aids

A variety of professionals, including teachers and development workers have recognised that the use of visual aids are effective in helping people learn and remember information. They may also enable illiterate individuals to analyse, express and record their choices (Harford and Baird, 1997). There are a number of issues to consider when designing visual aids for a target audience, these include: is the target audience visually literate, and are

they familiar with the process of finding out information from pictures, photos and symbols? (Harford and Baird, 1997). Other considerations concerning the target audience include, age, formal education level, gender and the languages used for any text (Harford and Baird, 1997). Care also needs to be taken concerning any social, political, cultural or religious beliefs, for example selecting the official, national language may marginalise and alienate those who use and feel the regional language is important (Harford and Baird, 1997).

Piloting and pre-testing is an important step in the design and development of visual aids which provides feedback on their content and the opportunity to revise them appropriately. Pre-testing the images used in visual aids is extremely important so as to ascertain the most appropriate image style to utilise (e.g. black and white, colour, background removed, cartoon style) (Harford and Baird, 1997; Linney, 1995). This ensures that messages are being interpreted correctly and that content and key messages are not being misunderstood, which can have negative consequences (Harford and Baird, 1997). It is also important that visual aids reflect the current and particular local situation (Harford and Baird, 1997). Relevance is particularly important, and an effort to use local people in visual images is seen as appropriate as the target audience understand local problems (Harford and Baird, 1997). If text is to be used on the visual aids, then consideration must be given to the direction in which the language is read. Many languages are read from right to left, and this may therefore influence the direction of any text and the order of any images used in sequence (Harford and Baird, 1997; Linney, 1995). A series of images cannot be assumed to be connected, and symbols such as ticks, crosses and arrows are culturally specific and may not always be understood by the intended target audience (Harford and Baird, 1997; Linney, 1995). One study in Northern Ghana which aimed to raise farmers' awareness of the long-term Striga problem and to educate them about its biology and potential control measures used a felt picture course to achieve its aims (Feil et al., 1997). The decision to use a felt picture was made due to its low cost, ease of transportation, non reliance on electricity and its ability to address non-literate individuals (Feil et al., 1997).

To have the greatest impact, visual aids should be selected and produced specifically for an individual context, according to resources, budget and the purpose of the project (Harford and Baird, 1997). This results in the production of visual aids that are directly relevant and appropriate for the intended target audience (Harford and Baird, 1997). Communication

theory supports that simplification and standardisation are the strengths and attractiveness of drawn pictures (Hoffmann 1990, cited by Feil et al. 1997). It is unlikely that pictures with lots of technical details will be self-explanatory and combination with other media may help to ensure that information is correctly understood (Feil et al., 1997).

3.2 Radio

Radio is still the most dominant mass-medium in Africa, with the widest geographical reach and the highest audiences compared to television (TV), newspapers and other information and communications technologies (Moussa et al., 2011; Myers, 2008). Egbule and Njoku (2001) reported that radio was the main format by which farmers in Nigeria gained agricultural information. Radio helps to bridge the 'digital divide' by providing a channel for information dissemination, especially for inaccessible rural audiences (Myers, 2008). The terms rural radio and community radio have been used interchangeably to describe FM stations established to broadcast to a local and predominately rural audience. The understanding of the term rural radio has changed over the years, one understanding is that *'it is a geographically descriptive term which acts as a powerful metaphor for the developmental process of connecting people together across remote communities so that they can share knowledge, information and culture'* (Chapman et al., 2003). Rural radio has also included approaches such as the community audio tower system (CATS) which utilises karaoke equipment linked to a metallic tower with all-weather loudspeakers to disseminate information (Chapman et al., 2003).

Agricultural extension can potentially benefit from both the reach and the relevance that local broadcasting can achieve. Rural radio can be used to improve the sharing of agricultural information by remote rural farming communities (Chapman et al., 2003). It is one of the best mediums for spreading awareness of new ideas to larger numbers of people and can be used to publicise extension activities (Chapman et al. 2003). The strength of rural radio is its ability to reach illiterate farmers and provide them with information relating to all aspects of agricultural production in a language they understand. Radio broadcasts occur in many local languages, so information does not depend on knowledge of official language and does not depend on literacy (Moussa et al., 2011). There must be an understanding of the way in which farmers themselves discuss their problems in the community and the provision of relevant information in a cultural context. Oakley and Garforth, (1985) describe a number of limitations with radio: radio is an

inflexible medium (a programme is transmitted at a specific time and with no record of the message), and it is not a good medium for transferring long, complex items of information. In one study in Ghana, all farmers said they listened to radio regularly, and some 58% owner radio sets, the rest relied on their friends and neighbours (Chapman et al., 2003). Another study by Tesfaye et al. (2005) found that 49% of rural farmers in Ethiopia owned radios and they reported that they obtained useful information about agricultural technologies through broadcasts.

The prevailing culture of African radio is that of the live broadcast, rather than pre-prepared programmes (e.g. dramas, magazines or talk-shows involving experts). Pre-prepared programmes (of which much development content is) are normally produced by separate production houses, funded by donor aid with radio stations charging air-time to NGOs to broadcast their programmes (Myers, 2008). Farm broadcasts will only be attractive to farmers if they are topical and relevant to their farming practices (Oakley and Garforth, 1985). A format that combines a drama performed by local actors with corresponding thematic discussion is popular amongst farmers listening to agricultural extension radio programmes in Ghana (Chapman et al., 2003). Target audience research can help to determine programme content, broadcast schedules and the preferences of listeners regarding the mix of information and education in the format (Chapman et al., 2003).

One Food and Agriculture Organisation (FAO) programme used CATS in a campaign to improve rice production for farmers using three half-hour broadcasts over a four-month period, followed up in the community with training, printed material dissemination and field demonstrations. Amongst the farmers surveyed, knowledge had increased from 55% to 92% and recommended practices from 46% to 68% respectively (Coldevin 2000, cited by Chapman et al. 2003). De Silva and Garforth (1997) showed that radio was an effective method to increase the knowledge of farmers in Sri Lanka concerning insecticide use in paddy cultivation. In radio programmes to transfer information in Ghana, farmers ranked the following aspects of the programme content as the top three: the drama, the talk and the conclusion. The majority of participants responded that they would have preferred the radio programme to be played between seven and nine in the evening, as this is likely to be a time of day when they are not working (Chapman et al., 2003). There was a significant increase in technology adoption (cowpea storage) in West Africa (by 23% in Niger and 20% in Burkina Faso) in villages that reinforced village demonstrations with a radio programme

in local language (Moussa et al., 2011). One study evaluating the effectiveness of a radio drama promoting family planning in The Gambia found that program exposure was associated with an increase in knowledge. The effect was greatest among uneducated individuals, with an increase in contraceptive users and methods used and an increase in positive attitudes from 10% to 27% (Valente et al., 1994). This programme had 39 episodes, each lasting 15 minutes in length and was broadcast weekly as part of a popular regular broadcast. The format used by the broadcast was that of a soap opera involving three families living in a fictional village. This study also concluded that the programmes ability to reach uneducated respondents has an empowering influence on women, as many forms of education rarely reach women directly.

3.3 Group Meetings

Farmers groups are an important channel for community-based extension, and groups are important in the dissemination of information and technology (Davis et al., 2004). Davis et al. (2004) showed that the homogeneity of a group was positively associated with individuals' perception of agricultural innovation adoption (fodder planting). More homogenous groups were more successful in knowledge dissemination, with stakeholders in the study proposing that this was likely a result of homogenous groups being similar in understanding, unity, common interests, language, goals and objectives (Davis et al., 2004). The likelihood that messages are understood may be increased by providing opportunities for individuals to ask questions during the dissemination process, however large, mixed audiences may act as a deterrent to this (Mitchell et al., 2001). Davis et al. (2004) reported that if groups have received adequate training, they are effective at extending information and techologies to other farmers. This study concluded that capacity building and increasing group linkages are important for increasing the success of farmer groups in knowledge dissemination.

Within rural Ethiopian society, other important social networks and groups exist. In most cases these networks are not governed by a commercial factor, but rather by trust and mutual interdependence (Seboka and Deressa, 1999). These social networks have many roles, including rotating of credit schemes, mutual exchange of labour during heavy work periods and co-rearing and co-sharing of livestock. The social networks are reinforced by the most significant traditional institution called 'Edir' (Tesfaye et al., 2005; Seboka and Deressa, 1999). Edir is a burial society, but has evolved to become a welfare society and a

kind of 'political' body, with access to all individuals. It also functions as a platform for members to inform each other about developments, emerging issues, new information and social affairs (Seboka and Deressa, 1999).

3.4 Video

Video has been utilised to transfer information in a number of fields, including human and animal health (Bell et al., 2005; Kelly et al., 2003; Eaden et al., 2002; Sweat et al., 2001; Torabi et al., 2000; Yuan et al., 2000). Educational video programmes have been shown to increase the knowledge of recipients on specific subjects (Bell et al., 2005; Kelly et al., 2003; Eaden et al., 2002; Torabi et al., 2000; Yuan et al., 2000).The benefit of video as an educational medium is that it provides a consistent form of teaching and can communicate concepts in a realistic and visual manner (Eaden et al., 2002). For those with low reading skills, video may offer a significant advantage over printed materials because of their visual appeal (Eaden et al., 2002). One of the main advantages of video as a mass medium for extension is that it is visible; the audience can see as well as hear the information it contains. This makes it possible to explain things that are difficult to describe in words (Oakley and Garforth, 1985). However, the cost-benefit of designing, developing and delivering a video must be considered against the efficacy of other knowledge-transfer interventions. The use of video as an extension approach may be problematic if villages have no electricity, however this can be addressed by the use of generators.

In one study where a video was used in conjunction with a leaflet, a change in knowledge of 70.5% was seen immediately after the intervention and 54.5% at a one month follow up (Eaden et al., 2002). In a randomised controlled trial by Kelly et al., (2003), the video intervention significantly improved knowledge, attitude, behaviours and behavioural intention of the participants. Yuan et al., (2000) concluded that a combination of video and a booklet had a significant effect on the knowledge and behaviour of children in China with regards to schistosomiasis and avoidance of exposure to the disease. A study with rural women in Benin demonstrated that more than 95% of those that watched the video adopted drying rice technologies compared to 50% of those that received the traditional two day community workshop (Zossou et al., 2009). McBean, (1989) evaluated the use of a video drama "Sanu" with villagers in Nepal. Over 80% of respondents reported that the video was about the treatment of diarrhoea with "nun-chini-pani" (salt and water) and 75% were able to give the correct measurements for making the drink. Responses suggested

that most villagers were able to understand and follow the plot of the story, with over 80% consistently giving correct answers to questions. The study by Zossou et al., (2009) concluded that the farmer to farmer video reached more women (74%) than those reached by conventional training (27%). One of the advantages of the video programme was that all the women in the village received the information at the same time. This has the potential to remove any of the negativity that can be associated with information ownership and leadership in villages (Zossou et al., 2009). One participant in this study stated that *'the video is of course a good way to learn because it allows the entire village to see the technology that only one or two people for the village saw during the conventional training'*. From the 89% of participants who strongly appreciated the video, two characteristics emerged: that the video 'burns images into memory' and that video helps people both learn and be entertained (Zossou et al., 2009).

3.5 Information Communication Technology (ICT)

ICT can be utilised as an extension tool for the transfer of information and for improving access to information (Garforth 2003, cited by Ramkumar et al., 2007). With appropriate consideration given to their design, ICTs can also be used to assist vulnerable groups move out of 'information exclusion' (Kruger 1998, cited by Ramkumar et al., 2007). One study with landless cattle owners in India trialled the use of an ICT kiosk for dissemination of cattle health information (Ramkumar et al., 2007). The advantages of this approach were that cattle owners were able to get information in their own language, at an easily accessible location and free of charge. The combination of visuals images (pictures) also meant that information was clearer and more complete (Ramkumar et al., 2007). The disadvantages of this approach were that it was only operational for a limited period of time during the day, required a continuous power supply and that it could not provide specific answers or suggestions to specific questions from owners (Ramkumar et al., 2007). Previous studies by O'Farrell (2001) cited by Ramkumar et al., (2007) have suggested that the majority of people in rural areas will not in the foreseeable future benefit from modern ICT unless an individual or organisation acts as an intermediary between them and the technology.

Objectives of the Thesis

It is evident that working equids contribute greatly to the lives and livelihoods of the majority of individuals and communities in Ethiopia. However, as evidenced in this literature review, there is high disease prevalence and many poor management practices that affect the health and welfare of these equids. It is likely that some improvements to health and welfare of working equids can be made by the use of appropriate education or extension programmes for the owners and users of equids, however the appropriate content and optimum method of delivery is uncertain.

The studies presented in this thesis aim to identify and prioritise existing disease and health knowledge and perceptions amongst working equids owners, evaluate existing animal health information sources and design, develop and evaluate an appropriate knowledge-transfer programme for rural donkey owners in Ethiopia. A number of studies and methodologies were utilised to achieve the thesis objectives.

Chapter Two uses participatory methodologies to rapidly identify and prioritise, with owners, the diseases and health concerns in working equids in 16 sites from three regions in central Ethiopia. Triangulation of these results with those obtained from the literature review in Chapter One give an overview of the major disease and health constraints to the working equid population in Ethiopia.

Chapter Three describes studies to identify information sources through which working equid owners and users in Ethiopia acquire knowledge about equid health. This included interviews, a Participatory Situation Analysis and a large cross-sectional study of 516 randomly selected rural farmers (who owned donkeys) in 32 randomly selected villages in central Ethiopia. All participants completed a questionnaire measuring their knowledge of a donkey healthcare issue (wounds and wounds management). Information was also collected from participants concerning the sources they contacted for information and the reliability of the information sought.

Chapter Four describes the design and development of education materials for knowledge-transfer in three formats, an audio programme, a village meeting and a diagrammatic handout. The content of these knowledge-transfer interventions was wounds and wound management in donkeys. A cluster-randomised controlled trial was used to compare the effectiveness of the three different knowledge-transfer interventions on short-term

knowledge change (approximately two weeks post-intervention) of 516 rural Ethiopian working donkey owners in 32 villages.

Chapter Five evaluates the efficacy of the three different knowledge-transfer interventions in the trial described in Chapter Four on long-term knowledge change (approximately six months post-intervention). Multilevel, multivariable logistic regression analyses were used to explore whether learning was different across different questions topics and learning objectives, and to examine other factors associated with learning. This chapter also describes an evaluation of participants' opinions and intended behaviour using thematic coding to extract important themes from qualitative data.

Chapter Six reviews the information gained from these studies, discusses limitations and practical applications of the study findings.

CHAPTER TWO:

Participatory situation analysis: owner knowledge and perceptions of working equid health and disease in central Ethiopia

Abstract

This study used participatory methodologies to identify and prioritise, with owners, the diseases and other health concerns in working equids in central Ethiopia. A Participatory Situation Analysis (PSA) was conducted in 16 sites in a range of agro-ecological zones (eight urban towns containing predominantly cart horse owners, and eight rural villages containing predominantly donkey owners). Sites were classed as exposed (previously exposed to an equine veterinary non-governmental organisation (NGO) or equine education/research programme) and non-exposed (those with no previous exposure). Multiple participatory methodologies were utilised, including ranking, matrices and focus group discussions to gather information from groups of owners. Owners' perceptions on frequency, importance, morbidity and mortality of volunteered diseases and the clinical signs that owners attributed to each disease were obtained; information regarding the socio-economic impact of these diseases and health concerns was also sought.

Forty separate disease and health problems were volunteered by horse and donkey owners. Horse owners volunteered a musculoskeletal syndrome (with the local name 'bird', clinical signs suggest possible disease pathologies including equine exertional rhabdomyolysis), colic and Epizootic Lymphangitis most frequently, whereas donkey owners volunteered sarcoids, nasal discharge and wounds to occur most frequently. One problem (coughing) was volunteered frequently by both horse and donkey owners. Owners demonstrated knowledge of differing manifestations and severity of these problems, which resulted in differing impacts on the animals working ability. Both donkey and horse owners were able to volunteer clinical signs and describe the socio-economic effects of the problems.

Although many of the diseases and clinical signs had been reported previously, and results from this study were largely in agreement, the study also identified some differing priorities such as rabies in donkeys, an unidentified musculoskeletal syndrome in horses and respiratory signs in both horses and donkeys. This study compliments previous studies by focussing on owners' knowledge and perceptions of working equid health and disease problems. The information gathered during this study may be used to inform and target educational interventions, clinical programmes and further research in equid health in developing countries.

Introduction

It is reported that 2.0 million horses, 0.37 million mules and 5.7 million donkeys comprise the working equid population in Ethiopia, the largest population of donkeys in Africa and second largest donkey population in the world after China (Anon, 2012). The role of working equids in the socio-economics of Ethiopia is substantial, with the majority of the Ethiopian population dependent on traditional subsistence agricultural production (DFID, 2006). Livelihoods are predominantly based on agriculture, which accounts for 85% of employment, 45% of national income and over 90% of export earnings. However, Ethiopian agriculture remains low-input, low-value and subsistence-oriented (DFID, 2006). Working equids have a direct impact on the lives of rural people by reducing the transport burdens of water, fuel, wood and goods (Garuma et al., 2007), and are also used for the transportation of people and in some areas for agricultural purposes (Garuma et al., 2007; Gebreab, 1997). There is a clear division of labour between the equine species; donkeys are mainly used as pack animals (Gebreab et al., 2004; Kidanmariam, 1997), with a minority used to pull carts; whilst horses are predominately used as harness animals and for riding (Wilson, 1990).

Horses, donkeys and mules in Ethiopia suffer particularly from prevalent parasitic and infectious disease, and diseases associated with poor management practices (Curran et al., 2005; SPANA, 2005; Yilma et al., 1990). These issues contribute to low productivity and can cause severe welfare problems (Pritchard et al., 2005). The typical life span of Ethiopian donkeys (9-13 years) is much shorter compared to a possible 37-40 years in donkeys in the UK (Svendsen, 1994). Disease and health problems afflicting working equids in Ethiopia have been previously documented (Shelima et al., 2006; Yoseph et al., 2005; Kebede et al., 2000; Yilma et al., 1990). However, many of these studies were undertaken within populations of animals presenting at clinics, or were based on clinical and/or pathological findings from cross-sectional surveys.

Harness related wounds have been documented as one of the most prevalent health problems in equids in Ethiopia (Biffa and Woldemeskel, 2006; Shelima et al., 2006; Curran et al., 2005; Yilma et al., 1990) and sores were the most important disease as identified by owners in an assessment by Kebede et al. (2000). Colic is a common owner reported health concern of working equids (Shelima et al., 2006; Curran et al., 2005). Coughing and nasal discharge have been previously reported as prevalent conditions by donkey (Curran et al.,

2005) and horse owners (Shelima et al., 2006). Epizootic Lymphangitis (EZL), is a well documented disease of working equids in Ethiopia (Ameni, 2006; Ameni et al., 2006; Ameni and Terefe, 2004; Ameni and Siyoum, 2002;), with severe economic consequences for the cart horse population in Ethiopia (Zerfu, 2007; Ameni, 2006; Ameni and Siyoum, 2002). Helminthiasis has been documented as a significant problem to equids, many having a polyparasitism problem (Getachew et al., 2008a; Fikru et al., 2005; Yoseph et al., 2005; Gebreab, 1997; Yilma et al., 1990). Sarcoidosis is an issue that affects predominately the donkey population in Ethiopia (Getachew, 1999; Yilma et al., 1990). Diseases and health problems affecting working equids vary depending on agro-ecological zones (e.g. AHS more prevalent in low and midland areas compared to highland areas), as well as species of equid (e.g. EZL more prevalent in horses than donkeys).

There is, however, little information on working equids owners' perceptions and prioritisation of these disease and health problems. In two participatory studies, the most frequently encountered problems were respiratory problems (coughing and nasal discharge), colic, back sores and EZL (Admassu and Shiferaw, 2011), and EZL, hoof problems, 'bird', colic and respiratory problems (Scantlebury et al., 2010). The ability of livestock owners to effectively identify and describe different diseases in other livestock and camels has been well reported (Shiferaw et al., 2010; Rufael et al., 2008; Catley, 2006; Mochabo et al., 2005; Catley et al., 2004; Catley et al., 2002; Catley et al., 2001).

Participatory research methods were first introduced in the 1970's as the beginning of a movement away from formal data collection towards more participatory approaches, better suited for programmes in less developed countries (Chambers, 1983). Participatory methods are now widely used in development projects, livestock research and in community-based animal health projects (Catley, 2006; Admassu et al., 2005; Catley et al., 2004; Catley et al., 2001; Catley and Mohammed, 1996; Kirsopp-Reed, 1994), and more recently in studies on working equid health (Upjohn et al., 2012; Scantlebury et al., 2010). Participatory epidemiology evolved with the increased use of participatory approaches for veterinary applications, predominately with its focus on livestock species (Catley et al., 2012). There are three main groups of participatory methods: informal interviewing methods, visualisation methods and ranking or scoring. Irrespective of which particular methodology is utilised, all are supported by knowledge of the relevant secondary literature and direct observation (Catley, 2005). An important feature of participatory approaches is the use of learning and analytical methods with communities, enabling

participants to express their own knowledge in their own language (Catley, 2006), and to generate information that has local validity (Catley et al., 2012).

Certain participatory approaches such as focus group discussions produce data that is largely qualitative in nature. The use of thematic analysis to code this qualitative data allows valuable information to be extracted from discussion transcripts (Fereday and Muir-Cochrane, 2006). Thematic analysis involves the search for themes that emerge as being important. It is a form of pattern recognition within the data which allows emerging themes to become categories for analysis (Fereday and Muir-Cochrane, 2006). Participatory approaches aim to use indigenous knowledge as a basis for developing interventions (Catley, 2005). The data obtained can be compared with data from other methods used in the same or similar populations, a process of cross-checking or comparison called triangulation (Catley, 2005). A mixed methods approach (using qualitative and quantitative data) can be employed as part of a detailed situation assessment prior to developing and implementing any interventions (Upjohn et al., 2012). Qualitative and quantitative data gathered utilising differing approaches are both extremely valuable and complimentary to each other, and can help to form an accurate picture of the situation.

Researchers, donors and implementing organisations would benefit from adjusting potential project activities and adopting more participatory approaches at the start of a project to ensure community participation and increase the likely impact of an intervention (Catley et al., 2002). The process of recognizing the valuable indigenous knowledge of animal owners within communities and utilising this knowledge would help to strengthen relationships between communities and veterinary service providers (Catley, 2006).

The aim of this study was to identify and prioritise the disease and health concerns that affect working equids according to their owners using participatory approaches. Owners' perceptions on frequency, morbidity and mortality, and socio-economic impact of volunteered diseases, and the clinical signs that owners attributed to each disease were also obtained. The objective was to ascertain a more accurate picture of the health and disease issues affecting working equids in the target population and owners' knowledge and perceptions about them, to enable targeting of educational interventions and future research.

Materials and Methods

Survey Sites

The PSA was conducted between January and March 2008. Sites were selected from three regions in central Ethiopia: Oromia, Amhara and Southern Nations, Nationalities and People's Region (SNNPR). Sites were selected in a range of agro-ecological zones, and comprised either rural villages that contained predominately donkey owners, or towns with predominately horse owners (Table 1). Towns and villages were selected based on the logistics of transportation, but were chosen to be representative of other towns and villages in the region. Sites were designated as either "exposed" if they had previous known exposure to an equine NGO or equine education/research programme, or "unexposed" if they were a naive population with regards to the above criteria. Of the eight towns, five were categorised as exposed and three as unexposed. Of the eight villages, four were categorised as exposed and four as unexposed. Due to the distances between exposed and unexposed sites, it is unlikely that any contamination (mixing of individuals) in this study would have occurred.

Table 1: Information on the towns and villages selected in the PSA.

Town/Village Name	Horse owners	Donkey owners	Region	Zone	Woreda (Municipality)
Awash	U		Oromia	East Shewa	Adama
Awassa	E		SNNPR	Sidama	Awassa
Debre Brehan	E	E	Amhara	North Shewa	Basuna Warano
Debre Zeyit	E	E	Oromia	East Shewa	Ada
Dera	U		Oromia	Arsi	Dodota
Gamo		E	Oromia	East Shewa	Dugda
Gemeda (Akaki)		E	Oromia	Addis Ababa Area	Akaki
Merino (Akaki)		E	Oromia	Addis Ababa Area	Akaki
Nazaret	E		Oromia	East Shewa	Adama
Shashemene	E	U	Oromia	West Arsi	Shashemene
Sheno		U	Oromia	North Shewa	Kimbibit
Ziway	U	U	Oromia	East Shewa	Batu

U = Unexposed village or town. E = Exposed village or town

Survey Participants

Participants were eligible for inclusion in the PSA if they lived within the selected town or village and either owned or used a donkey or horse. Participation was entirely voluntary, with no financial incentive offered, and owners were free to leave at any point. Participants

were selected for the PSA using two different methods. In exposed towns and villages, owners were approached during their attendance at the mobile veterinary clinic. Participants from unexposed towns and villages were recruited using development agents assigned from the relevant Bureau of Agriculture. Participants were asked to gather at a designated site at a specific time. The study was conducted in accordance with the research ethics requirements of the Faculty of Veterinary Science at the University of Liverpool. Informed verbal consent was obtained from all participants involved in the study following a short introductory briefing concerning the purpose of the PSA. This briefing also stressed that participation in the study was voluntary and that people were free to leave at any time.

Participatory Situation Analysis (PSA)

The PSA was conducted in either of two regional dialects (Amharic and Afan Oromo) as dictated by the participants' preference. One Ethiopian national, who was fluent in Amharic, Afan Oromo and English, was used as both a translator and facilitator for the PSA. This individual had previous experience in the field of animal health and had received training in participatory approaches. The PSA was based on five questions in a semi-structured interview (SSI) format, and utilised a number of different methodologies (Table 2 and Appendix 1). The PSA was piloted with horses and donkey owners from other villages and towns not involved in this study, and questions underwent reverse translation prior to commencing the study. Additional background information (survey site longitude/latitude, participant gender) was also collected.

Participants were initially asked to volunteer all disease and health problems that afflicted either their donkeys or horses. Following this, the group was asked to arrive at a consensus on a ranking of these diseases in order of how commonly they were encountered. For each of the volunteered diseases, all participants in the group had to form a consensus on how long an animal would be out of work and unable to perform its duties if afflicted with a particular disease. In open discussion owners were then asked to describe the socio-economic effects of their animal being afflicted with a disease, and to describe clinical signs associated with the diseases.

Table 2: Semi-structured interview questions and participatory methodologies used in the PSA.

Semi-structured interview questions	Methodology
What are the common diseases and health concerns that affect your horses and donkeys?	Open discussion and listing
How common are these conditions?	Ranking
How long do these conditions affect your horse, mules or donkeys ability to work?	Matrices[#] (disease volunteered against time period not able to perform work)
Do these problems affect your job, income and lifestyle?	Open discussion
What are the clinical signs associated with these diseases?	Open discussion

[#]Options in matrices (Never out of work, out of work for up to 1 day, out of work for up to 1 week, out of work for up to 1 month, out of work for greater than 1 month and permanently out of work).

Data Recording and Analysis

Data were initially translated and recorded in written format by a dedicated recorder in English, and using digital photos of completed matrix boards. These data were then entered into a spreadsheet programme (Microsoft Excel 2007, Microsoft Cooperation, USA). Data were analysed descriptively or thematically coded using a qualitative data software programme (NVIVO 8, QSR International) and (R, http://www.r-project.org). Owners volunteered disease and health problems using local names in either of the two regional dialects (Afan Oromo and Amharic). These local names were then converted into the equivalent English names during the analytical stage; where locally named conditions were not directly translatable; the clinical signs described by the participants were compared with standard descriptions of diseases in veterinary textbooks used to assist identification of the disease or health problem. Health problems were ranked in two ways. Firstly by the number of times individual groups volunteered the specific problem (count rank) and secondly using a weighted score depending on where groups ranked each problem (score rank); the problem ranked first was given a score of ten, nine for second place, continuing until all problems were assigned a score.

Results

Piloting on 10 groups in four sites led to minor modifications to the semi-structured interview questions. These modifications were made to ensure that an accurate translation of the researchers intended questions was obtained. Subsequent to piloting, a total of 160

participants - 10 participants (two groups of five participants) per site - participated in this study. Forty separate disease and health problems were volunteered by horse and donkey owners (Table 3). Only one condition (coughing) was volunteered frequently by both horse and donkey owners. Many problems were volunteered more frequently by horse owners (e.g. musculoskeletal syndrome with the local name 'bird', clinical signs suggest possible disease pathologies including equine exertional rhabdomyolysis, EZL and colic) or donkey owners (e.g. sarcoids, nasal discharge and wounds). Donkey owners perceived wounds to be the most common problem affecting their animals in unexposed towns, followed by sarcoids, nasal discharge and coughing (Table 4). In exposed towns, donkey owners perceived nasal discharge to be the most common problem followed by coughing (Table 4). Horse owners perceived 'bird' to be the most common problem affecting their animals in unexposed sites, followed by EZL and colic (Table 5). In exposed sites, EZL was also the most common problem followed by coughing, colic and 'bird' (Table 5).

Table 3: Complete list of all disease and health problems volunteered by 32 groups of horse and donkey owners at 16 sites in Central Ethiopia.

Disease and Health Problems	Groups of horse owners that volunteered the disease (n^{max}=16)	Groups of donkey owners that volunteered the disease (n^{max}=16)	Disease and Health Problems	Groups of horse owners that volunteered the disease (n^{max}=16)	Groups of donkey owners that volunteered the disease (n^{max}=16)
Musculoskeletal	10	2	Nasal discharge	4	12
EZL	14	0	Diarrhoea	1	0
Coughing	10	11	Swelling above eye	2	0
Foot abscess	5	1	Swelling on neck	1	0
Colic	11	5	Swollen leg/lameness	4	0
Corneal opacity	1	0	Joint swelling	1	0
Parasites	5	5	Shivering	1	0
Wound on upper lip	6	0	Thin	1	0
Rubbing	1	1	Abdominal swelling	1	0
No urination	3	4	Rabies	0	5
Bloating	2	5	Weight loss	0	3
Circling	1	0	Hoof problem	0	3
Hair loss	1	1	Food poisoning	0	1
Knee Swelling	2	0	Limb abnormality	0	1
Wound	3	9	Drying of the back	0	1
Sarcoids	0	10	Leech	0	1
Anthrax	2	1	Abortion	0	1
Sudden Death	0	1	Eye infection	0	1
Day Disease	3	4	Swelling of eye	0	1
Mouth lesion	3	0	Bloody urine	0	1

EZL = Epizootic Lymphangitis, Day Disease = Unknown disease (likely to be African Horses sickness in horses), Musculoskeletal = musculoskeletal syndrome (with the local name "Bird" in horses, clinical signs suggest possible disease pathologies including equine exertional rhabdomyolysis)

Table 4: Top 10 ranked (using combined count rank) health problems volunteered by 16 groups of donkey owners at eight different sites in Central Ethiopia.

	Unexposed Sites		Exposed Sites		Combined	
Health Problem	**Count Rank**	**Score Rank**	**Count Rank**	**Score Rank**	**Count Rank**	**Score Rank**
Nasal discharge	3=	3=	1	1	1	1
Coughing	3=	3=	2	2	2	2
Sarcoids	1=	2	3=	5	3	4
Wound	1=	1	7	7	4	3
Colic	6	6	8=	-	5=	9
Bloating	9=	10=	3=	3	5=	5
Rabies	-	-	3=	4	5=	6
Parasites	9=	9	3=	6	5=	7
Day Disease[a]	7=	7=	8=	8	9=	8
No urination	5	5	-	-	9=	10
Weight loss	-	10=	8=	9	11=	-
Hoof problem	-	-	8=	10	11=	-
Musculoskeletal[b]	7=	7=	-	-	-	-

[a]Day Disease = Unknown disease, [b]Musculoskeletal = unknown musculoskeletal syndrome
Count rank = number of times individual groups volunteered the specific problem.
Score rank = weighted score depending on where groups ranked each problem (problem ranked first given a score of ten, nine for second place, continuing until all problems were assigned a score).

Table 5: Top 10 ranked (using combined count rank) health problems volunteered by 16 groups of horse owners at eight different sites in Central Ethiopia.

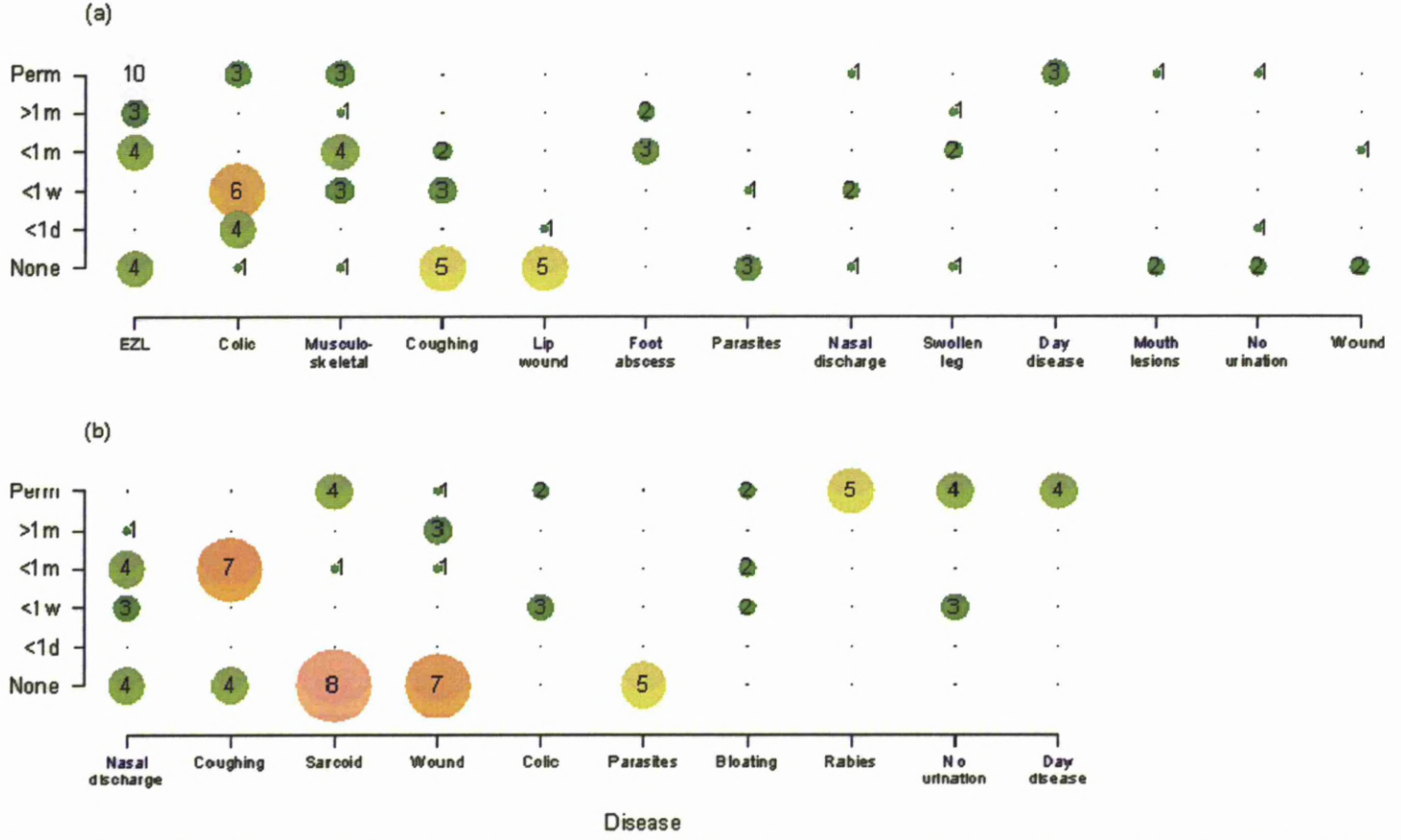
	Unexposed Sites		Exposed Sites		Combined	
Health Problem	**Count Rank**	**Score Rank**	**Count Rank**	**Score Rank**	**Count Rank**	**Score Rank**
EZL	1=	2	1=	1	1	1
Colic	3	3	3	3	2	2=
Musculoskeletal[b]	1=	1	4=	4	3=	2=
Coughing	5=	9	1=	2	3=	4
Lip wound	5=	10	4=	6=	5	5
Parasites	-	-	4=	5	6=	6
Foot abscess	-	-	4=	6=	6=	7
Swollen legs	5=	4	9=	13	8=	8
Nasal discharge	5=	5	9=	12	8=	9=
No urination	-	11=	9=	8	10=	9=
Mouth lesion	5=	7	-	-	10=	11
Day Disease[a]	4	-	-	9	10=	12
Wound	-	-	8	10	10=	13
Anthrax	5=	6	-	-	-	-
Swelling above eye	5=	7	-	-	-	-
Joint swelling	-	11=	-	-	-	-
Bloating	-	-	9=	11	-	-

[a]Day Disease = Unknown disease (likely to be African Horses sickness).
[b]Musculoskeletal = musculoskeletal syndrome (with the local name "Bird", clinical signs suggest possible disease pathologies including equine exertional rhabdomyolysis)
Count rank = number of times individual groups volunteered the specific problem. Score rank = weighted score depending on where groups ranked each problem (problem ranked first given a score of ten, nine for second place, continuing until all problems were assigned a score).

Horse and donkey owners identified the impact that each problem had on the ability of that equid to perform its role and to work, and these were recorded in matrices. Both sets of owners demonstrated knowledge of differing manifestations and severity of volunteered problems, resulting in a differing amount of time off work (Figure 1). Groups could volunteer more than one answer for each volunteered problem.

For example, horse owners reported two distinct severities of EZL (Figure 1a). One manifestation that does not affect the horse's ability to work and another manifestation that leads to significant time off work, and ultimately to the horse not being able to work. The same distribution is seen with colic in horses, with the majority of cases causing the horse to be off work for less than a week, but a small number of cases leading to the horse being permanently out of work or death. Coughing and lip wounds however both show that the majority of these cases have little impact on the ability of horses to work. For donkey owners (Figure 1b), nasal discharge shows two distinct manifestations of the disease: some donkeys remain working whilst others required one week to a month off work. A similar distribution was seen with coughing. In the majority of groups owners indicated that donkeys with sarcoids, wounds and parasites were not given any time off work.

Figure 1: Impact on working ability of the most frequently volunteered diseases of (a) horses and (b) donkeys in Central Ethiopia.



The size and colour of the circle in each graph represent the number of times this category was volunteered, also shown by the number in the circle. Key (x axis) :< 1 d = < 1 day, <1 w = <1 week, <1 m = <1 month, >1m = > 1 month, perm = permanently out of work

Both donkey and horse owners were able to attribute various clinical signs to the volunteered problems (Tables 6 and 7). Thematic coding revealed that owners had knowledge of the location of wounds on their donkeys; these were consistent with commonly known areas of injuries attributed to harnessing. Donkey owners also had knowledge of common sites for sarcoids, consistent with those previously documented in the literature. Coding revealed that bloating was often accompanied with no urination and not eating, these clinical signs are all consistent with an animal affected by colic, reported to be a common problem in working donkeys (Curran et al., 2005). For EZL, the most commonly volunteered problem amongst horses, owners accurately described the clinical appearance of the disease and the most commonly reported locations of lesions. For the musculoskeletal syndrome, owners reported that the two most frequently observed signs were a change in musculoskeletal system anatomy (e.g. muscle tone or limb deformity) and a change in locomotion. Owners had considerable knowledge of the clinical signs frequently observed in an equine affected by colic (e.g. rolling and restlessness).

Table 6: Thematically coded clinical signs attributed by donkey owners to volunteered disease problems

DONKEY OWNERS		
Problem (n=number of groups who volunteered this problem)	**Thematic description**	**Number of groups that volunteered thematic description**
Nasal Discharge (n=12)	Fluid/discharge from nose	12
	Head down	4
	Hole in throat [a]	3
	Not eating/drinking/breathing correctly	2
	Coughing	2
	Dead [b]	4
Coughing (n=11)	Coughing	11
	Swelling under abdomen	2
	Fluid from nose	4
	Death	2
	Occurs at night time	2
Wound (n=9)	Wound	9
	Awareness of wound locations	9
	Owner problem	4
	Sarcoid	2
Sarcoid (n=10)	Location of sarcoids	10
	Swelling first	4
	Bleeding	2
	Thin skin	2
Bloating (n=5)	Bloating	5
	No urination	2
	Loss of eating	3
	Reverse/not walking	2

[a] Hole in throat likely to be burst abscess. [b] Owners described this disease problem presenting as death in their animals on certain occasions.

Table 7: Thematically coded clinical signs attributed by horse owners to volunteered disease problems

HORSE OWNERS		
Problem (n=number of groups who volunteered this problem)	**Thematic description**	**Number of groups that volunteered thematic description**
EZL (n=14)	Swelling and wound	13
	Lesions on body	12
	Disease spread	11
	Limb	8
	Blood vessels	4
	Disease severity	2
	Transmission	1
Musculoskeletal (n=10)	Musculoskeletal change	9
	Locomotion	8
	Food and water	3
	Sweating	3
	Weight loss	1
Colic (n=11)	Rolling	10
	Restlessness	8
	No urination	5
	Work associated	4
	Bloating	3
Coughing (n=10)	Coughing	10
	Loss of appetite/thinner	5
	During/after work cough	3
	Foam and fluid	2
	Cough after eating	2
Lip wound (n=6)	Swelling/wound on upper lip	6
	Reduced water and feed intake	6

Owners were asked to describe the socio-economic effects that the volunteered diseases had on their job, income and lifestyle. Donkey owners commented that donkeys are used for many purposes, to *'bring water long distances', 'collect crops from field during harvest time', 'collect firewood from fields', 'take grain to millstone'* and *'carry sick person to clinic'*. They are considered by owners as *'our poor car'*, and if they get sick it is a *'big problem for the whole family dependent on a working donkey'*. Owners reported that it was currently expensive to buy a donkey (price in 2012, approximately 2100 Ethiopian Birr = £76 or $121) and if they lost a donkey it was difficult to find the money to replace it. Horse owners reported that the taxi cart is their source of income, and that if they were to lose their horse it was *'difficult to survive', 'could not participate in the Peasant Association as cannot pay them money', 'couldn't replace horse due to expensiveness', 'that there may be a*

disturbance of the family and the wife may go back to her family' and may have to *'sell our property in the house; sofa, table to survive'*.

Discussion

Using participatory methodologies, we were able to ascertain a more accurate picture of the knowledge and perceptions of Ethiopian working equid owners concerning the major disease and health concerns of working horses and donkeys. The results presented here have been used to inform the design and content of educational interventions that aimed to increase the knowledge of working equid owners about the health and welfare of their animals (Chapter 4 and Stringer et al., 2011), and also highlight areas requiring research and preventive interventions. In this study, owners reported that their working equids had many uses, and diseases and health problems which afflicted them greatly affected their family's income and lifestyle. This is consistent with previously documented literature which has shown that working equids have a direct effect on the lives of rural people by reducing the transport burdens of water, fuel wood and goods, and are also used for the transportation of goods, people and in some areas for agricultural purposes (Garuma et al., 2007; Curran et al., 2005; Gebreab, 1993).

In this study it was necessary to consider working equid owners as two different groups: those owners that predominately used donkeys (all of whom lived in rural areas) and those that predominately used cart horses (all of whom lived in urban/periurban areas). Differences between these populations of owners became apparent in relation to perceived health problems that were volunteered and ranked, and also in the socio-economic effects of the problems. There is a clear division of labour between the species in this region of Ethiopia; donkeys are mainly used as pack animals (Gebreab et al., 2004; Kidanmariam, 1997), although a minority are used to pull carts; whilst horses are predominately used as harness animals and for riding (Wilson, 1990). Horses primarily work within towns, pulling carts that carry people and goods. They are often owned by one person who rents them out to a driver to use throughout the day and thus provide their owner with a cash income. Both donkey owners and cart horse owners expressed the importance of their working equine in their daily lives. Although both use their equines on a daily basis, the cart horse drivers and owners rely on theirs for direct income generation. If a horse is lost to disease, then the income generating activities are immediately affected,

having a great impact on the livelihood of its owner and their family. Although donkeys are often considered a secondary animal in relation to oxen, they provide an entry point for assisting women in both domestic responsibilities and income generating activities. If they are lost to disease then their role is often filled by family members, often women, or by the rental of another family's donkey (Marshall and Ali, 1997).

Working equid owners often used local names to describe diseases seen in their animals, sometimes these names were specific to a clinical sign or disease, other times they described a cause or perceived route of transmission. This is consistent with a study with cattle owners in Kenya which concluded that the local and/or English terms provided for described diseases arose from ethno-diagnoses (Machila et al., 2003). These terms relied mainly on visible clinical signs and occasionally on the perceived cause of the disease (Machila et al., 2003). In our study, 40 separate disease, clinical signs and health problems were described by horse and donkey owners, which highlights both the diversity of diseases that afflict these animals but also the awareness of owners to these different disease problems. Donkey owners perceived wounds, nasal discharge, coughing and sarcoids to be the most common problems affecting their animals. When this information is triangulated with other sources of information on diseases of working donkeys in Ethiopia, there is strong agreement. For example, clinical treatment records from one veterinary charity (The Donkey Sanctuary, unpublished data, 2007) showed that wounds, back sores and respiratory problems (coughing and nasal discharge) were the three most commonly presented conditions at their veterinary clinics; whilst Curran et al., (2005) surveyed 200 Ethiopian donkey owners and the most prevalent health problems encountered were coughing and nasal discharge, followed by wounds and colic. Donkey owners in a study by Pearson et al., (2001) ranked respiratory disease first as the disease problem most afflicting their donkeys, whilst focus group discussions in another study identified respiratory problems (coughing and nasal discharge), colic and back sores as the health problems most commonly affecting equids (Admassu and Shiferaw, 2011).

The differences in the ranking of wounds on donkeys between unexposed sites compared to exposed sites may be due to the success of previous education and veterinary programme by The Donkey Sanctuary which have targeted wound prevention and treatment. In this study, donkey owners also considered parasites to be amongst a top ten problem for their animals, consistent with other studies that have documented polyparasitism as a finding in working donkeys (Fikru et al., 2005; Yoseph et al., 2005;

Gebreab, 1993; Yilma et al., 1990;). A similar finding with cart horses owners and donkey owners was the owner perception that parasites were a common problem, which is consistent with the published literature (Pandey et al., 1994). Bloating and no urination were also problems in the top ten, both of these are clinical signs which can be observed during an episode of colic, bloating as a result of trapped gas in the internal viscera, and no urination as a consequence of hypovolaemia. Colic is a common owner-reported health concern of working equids (Shelima et al., 2006; Curran et al., 2005), with Curran et al., (2005) reporting 59% of owners indicated that their donkey had colic in the previous year. The two most common causes of colic in donkeys as documented by clinical case records were tympanic colic and enterolithiasis or foreign bodies (Boija et al., 2006).

Owners in this study ranked rabies in the top five diseases to affect their donkeys, and yet this disease is not commonly seen in cases presenting at NGO clinics. Reasons for this finding could include: clinical cases dying before presenting at clinic or owners recognising clinical signs and abandoning or performing euthanasia. Owners in this study had a detailed knowledge of rabies, with regards to its transmission and disease prognosis. Rabies has been identified in a number of species in Ethiopia including working donkeys (Okell et al., 2012; Pearson et al., 2001; Fekadu, 1982). In a participatory study of rural farmers by Okell et al., (2012), the relative proportion of mortality in equines due to rabies was 14.8% out of all species studied, whilst a retrospective analysis of clinical cases seen by The Donkey Sanctuary reported a fatality rate of 100% (Boija et al., 2006). This finding concerning owners' perception of rabies in their donkeys is of particular importance due to its zoonotic potential, and lack of current veterinary interventions to reduce rabies within the equid population.

Horse owners perceived EZL, a musculoskeletal syndrome ('bird'), coughing and colic to be the most common problems affecting their animals. When triangulated with the clinical records of another veterinary charity (Society for the Protection of Animals Abroad, unpublished data, 2008) these conditions are in the top five disease problems most commonly presented to veterinary clinics for treatment. There is also agreement between this study's findings and those from other participatory studies (Admassu and Shiferaw, 2011; Scantlebury et al., 2010) and other studies (Shelima et al., 2006; SPANA, 2005). Scantlebury et al., (2010) identified EZL, hoof problems, "bird", colic and respiratory problems as the top five disease problems affecting working cart horses, whilst Admassu and Shiferaw, (2011) identified respiratory problems (coughing and nasal discharge), colic,

back sores and EZL as the health problems most frequently identified by working equid owners.

EZL has been well documented as a major problem of horses in Ethiopia that has a major impact on the socio-economics of owners (Zerfu, 2007; Ameni, 2006; Ameni and Siyoum, 2002). Studies in other developing countries have shown lameness, gait abnormalities and foot problems to be extremely common in all working equids, and are thought to result from a combination of risks (including traumatic injury, developmental issues, conformation and breed, nutrition, work related concussion on dry hard roads) and poor management practices (Broster et al., 2009; Pritchard et al., 2005). In one study, 74% of 201 interviewed Ethiopian carthorse owners said lameness was a disease constraint, ranking it fourth out of all diseases volunteered (Shelima et al., 2006). In this study, owners perceived a musculoskeletal syndrome, whose local name was 'bird', to be one of the top three problems of their horses. Owners did differentiate between this musculoskeletal syndrome and foot abscesses, which they also volunteered as a top ten problem in this study. This differentiation by cart horses owners between "bird" and foot abscesses is consistent with another study (Scantlebury et al., 2010). It was not possible to positively identify a specific disease to this syndrome ("bird"), although the clinical signs suggest possible disease pathologies including equine exertional rhabdomyolysis. Further research is required to explore this health problem in greater detail with owners, preferably involving clinical examinations and diagnostic investigation of the suspected equids with this syndrome.

Harness related wounds have been documented as one of the most prevalent health problems in equids in Ethiopia (Biffa and Woldemeskel, 2006; Gebreab and Fanta, 2006; Shelima et al., 2006; Curran et al., 2005) and this is consistent with literature from other developing countries (Aravindan et al., 2006). However, owners perceived wounds on horses to be less of a problem than was expected in this area, suggesting that although they may be prevalent as reported by published literature (Biffa and Woldemeskel, 2006), they are of lesser significance to horse owners, or they are not as common in this population.

It appeared that both cart horse owners and donkey owners were able to identify differing clinical manifestations or severities of diseases that had varying degrees of impact on the animal's ability to work. Horse owners' descriptions of the clinical signs seen with EZL were

consistent with the clinical pattern seen in an EZL case, that progresses from a mild case to a more severe case that is not treatable and ultimately leads to horses being abandoned (Scantlebury and Reed, 2010). A similar distribution for colic is also consistent with the clinical pattern seen in colic cases in horses in developed countries, with the majority resolving in a short period of time, whilst a minority are catastrophic abdominal events leading to death (Tinker et al., 1997). Donkey owners described the impact of nasal discharge as one of two patterns, either no impact, or that of requiring one week to a month off work. This may be due to the different possible aetiologies causing nasal discharge and coughing in donkeys. Some clinical cases could be mild, whilst others such as Strangles (*Streptococcus equi* infection) have the potential to be more severe. Little is known about the causes of respiratory disease in working horses and donkeys and this is an area that requires further research.

Both donkey and horse owners were able to attribute various clinical signs to the volunteered problems. Thematic coding revealed that owners had a significant knowledge of the location of wounds on their donkeys, consistent with commonly known areas of injuries attributed to harnessing (Gebreab and Fanta, 2006). Donkey owners also had knowledge of common sites for sarcoids, consistent with previously documented sites of occurrence of sarcoids (Ayele et al., 2006). For the musculoskeletal syndrome, owners reported that the two most frequently observed signs were a change in musculoskeletal system anatomy (e.g. muscle tone or limb deformity) and a change in locomotion. The ability of owners to identify differing clinical severities of disease is particularly useful when considering education programmes based on identification of the early stage of diseases. This finding is similar to another study by Eisler et al., (2012), which reported the ability of farmers (in Uganda) to identify clinical signs, some of which may not manifest at the time of the veterinary examination, but would be reported in the clinical history. However a study of cattle owners' perceptions of trypanosomiasis in Kenya, concluded that smallholder farmers did not appear to be good at recognising diseases from clinical signs they observed (Machila et al., 2003). Whilst another study of cattle owners in Zambia revealed low levels of awareness amongst owners to a specific disease (bovine tuberculosis) (Munyeme et al., 2010). Almost two thirds of clinical disease episodes were either not identified or identified incorrectly (Machila et al., 2003). However, other studies have indicated that livestock owners (specifically pastoralists) have a detailed knowledge about livestock health problems (Shiferaw et al., 2010; Rufael et al., 2008; Catley, 2006).

Pastoralists are a very different demographic of animal owners compared to urban horse owners. Pastoralists often spend most of their lives living closely with their animals and their daily lives revolve around the health, productivity and resources required for these animals (Catley, 2006). In one study, pastoralists were able to describe the clinical pictures, sources and transmission of various livestock diseases (Shiferaw et al., 2010). Other studies have shown that livestock keepers possessed specific mental pictures of the diseases being investigated (Catley et al., 2002; Catley et al., 2001). In the current study, many of the frequently volunteered diseases appeared to be a particular disease that was recognisable from either the clinical signs described, or the route of transmission.

It is possible that due to language translation issues we may have misclassified some diseases, a potential limitation of the study, and we also relied on participants volunteering information about disease identification without being able to validate the accuracy of their identification. One disease volunteered by cart horse owners, 'bird', could not be accurately identified. However the clinical signs suggest possible disease pathologies including equine exertional rhabdomyolysis (owners reported that the two most frequently observed signs were a change in musculoskeletal system anatomy (e.g. muscle tone) and a change in locomotion). Owners did not appear to be aware of the scientific name or aetiology of this specific disease, however exertional myopathy has been reported in working equids in other countries (Sharma and Murthy, 2006).

The participatory approaches used in this study to gather predominately qualitative information have strengths and weaknesses. The strengths of this approach are its ability to generate locally specific information that has local validity (Catley et al., 2012), and allow in-depth discussions that provide a better opportunity for understanding owners' concerns and perceptions (Upjohn et al., 2012). Potential weaknesses of participatory approaches are their specificity for the geographical area in which the study is conducted, and a lack of direct objective measurement of disease and health problems that can be obtained with classical quantitative epidemiological studies, such as a cross-sectional survey. The locations and the owners who participated in this study were deemed to be representative of other locations and working equids owners in the region. However, there is potential for selection bias as no random sampling process was utilised during this study to select either locations or participants, and owners who volunteered to participate in this study may differ in some way from those who did not want to participate. Both of these issues could

potentially lead to the locations and participants being a non representative sample of the intended target population.

It is clear that there are many disease and health constraints that impact on the working ability of equids. However, Curran et al., (2005) showed that the provision of animal health services to an area can result in a positive impact on the health and welfare status of those equids (reduction in health problems reported: wounds, colic, sarcoids and sudden death). This in turn leads to an improved productivity (increased body condition, increased working capacity and increased working life) and provides owners with a more reliable income source which can improve their livelihoods (Curran et al., 2005).

Conclusion

The participatory approaches utilised in this study provided a suitable and appropriate way for rapidly identifying and prioritising major disease and health concerns of working equid owners in Ethiopia. Despite the qualitative nature of this study, it highlighted agreement with many of the disease and health problems reported by veterinarians and those diseases and equine problems previously reported in the published literature. This study compliments previous studies by focussing on owners' knowledge and perceptions of working equid health and disease problems. The information gathered during this PSA may be used to inform decisions regarding the targeting of educational interventions and clinical programmes, and is of benefit to veterinarians, government and NGO's in identifying areas requiring further research. Future intervention programmes (educational or veterinary) will be more effective if perceived to be relevant to the target population and if utilising owners' existing perceptions and vocabulary (Machila et al., 2003).

It is also important to consider the differences between working donkey owners and cart horse owners, with regards to the major disease and health concerns that afflict their animals. Information gathered during this study not only identified disease and health problems that owners' percieve as important, but also highlighted that different disease and health problems affected different equid species. This study also identified that certain diseases remain poorly characterised by owners, and potentially need definitive identification before effective interventions can be developed.

Invaluable local knowledge about the study's target population, including equid disease profiles, owner perceptions and knowledge about equid disease, and vital cultural information then informed and optimised the design of subsequent educational interventions and quantitative data collection methodologies, and helped to ensure that content was relevant, appropriate and acceptable to the target population.

CHAPTER THREE:

Associations between sources of information and animal health knowledge of rural farmers in central Ethiopia

Abstract

A greater understanding of rural farmers' interactions with existing formal and informal information sources could potentially improve the development of appropriate knowledge-transfer pathways. This study aimed to identify information sources through which working donkey owners and users in Ethiopia acquire knowledge about donkey health and welfare. Individual interviews, a Participatory Situation Analysis (PSA) and a large cross-sectional study with rural farmers were utilised to gain an understanding of the existing sources of information concerning donkey health and husbandry. The individual interviews and PSA identified 11 sources of information for working donkey owners including, friends, family, neighbours, agricultural bureau, non-governmental organisations and traditional healers. The subsequent cross-sectional study involved 516 randomly selected rural farmers (who owned donkeys) in 32 randomly selected villages in central Ethiopia. All participants completed a questionnaire measuring their knowledge of a donkey healthcare issue (wounds and wounds management). Information was also collected from participants concerning the sources they contacted for information on donkey health and husbandry issues, the frequency of contact and the reliability of the information sought.

Numerous sources were utilised by owners for information regarding health and husbandry advice for donkeys. In the cross-sectional study, the percentage of owners who contacted specific information sources differed widely. The contact with these sources for the most part was on an irregular and needs basis. The majority of owners revealed that the sources were unreliable with regards to the information they provided on donkey health and husbandry. Cluster analysis suggested six distinct clusters of individuals based on sources contacted.

The median knowledge score of participants increased as the number of information sources contacted increased, with the lowest median knowledge score in the cluster who contacted no sources, and the joint highest median knowledge score was found in the cluster which contacted a mix of information sources. Knowledge score also increased with increasing education level, literacy ability and radio access. There was also a significant association between knowledge score and age, with knowledge score decreasing in older individuals. Multilevel linear regression models revealed formal education level, cattle ownership, whether a participant gives advice to other donkey owners and washes and cleans wounds on his donkey had a significant effect on the knowledge score (outcome

variable). This study has shown working donkey owners utilise numerous information sources and these sources may affect an individual's knowledge level concerning the husbandry and healthcare of working donkeys.

Introduction

The economy of Ethiopia is heavily dependent on the agricultural sector (particularly small scale mixed crop and livestock subsistence agriculture), which accounts for 40% of the national Gross Domestic Product (GDP), 90% of exports and employment of 85% of the population (CTA, 2008). Of a population of 77 million, 83.5% live in rural areas (CTA, 2008). The lack of effective extension dissemination routes has been cited as one of the major problems for Ethiopian agriculture (Aberra et al., 1996, cited by Tesfaye et al., 2005). A greater understanding of the existing formal and informal information sources and knowledge-transfer networks could potentially improve the development of appropriate extension approaches that facilitate knowledge transfer and innovation adoption (Tesfaye et al., 2005).

The terms information and knowledge are widely inter-related, however there is a clear difference between them. Information has been described as *'one or more statements, facts or news received by a human and that have some form of worth to the recipient, and is necessarily accurate, timely and new'* (Losee 1997, cited by Adolwa et al., 2012; Floridi, 2005). Knowledge has been described as *'information that is meaningfully aggregated into a reservoir of facts and concepts that can be applied or is information that is organized or processed'* (Asenso-Okyere and Davis, 2009; Rasmussen, 2001). The content or expertise of interest to the information seeker has been described as the 'source', whilst the method or vehicle by which information is transferred or received has been described as 'channels' (Adolwa et al., 2012)

An association between age, education level, illiteracy and the transfer, adoption and use of agricultural technologies in Ethiopian farmers has been identified by a previous study (Tesfaye et al., 2005), with other studies concluding that the level of education of the household head has a positive association with the level of intervention adoption (Asfaw 1997, cited by Tesfaye et al., 2005). Socioeconomic status was seen to play a role in access to agricultural extension services in one study by Mogues et al., (2009), with better educated farmers more likely to receive visits form extension agents, and a greater proportion of literate farmers attending extension meetings than illiterate farmers.

Yohannes et al., (1990) showed that the impact of education on Ethiopian farmers on the probability of adoption of agricultural practices (single-ox, pesticides and fertilizer technologies) was substantial. Households with some level of education are more likely to adopt technologies than those with none (Tesfaye et al., 2005), with Weir and Knight, (2000) finding that household-level education is important to the timing of adoption.

Numerous potential sources of information exist for Ethiopia farmers (Tesfaye et al., 2005), including government extension agents, contact farmers (successful and progressive farmers who become opinion leaders and are utilised in extension programmes), other farmers, radio programmes, neighbours, relatives, peasant association representatives and other social institutions. However, previous studies of agricultural extension in Ethiopia have emphasised the top-down approach to service provision, with the public sector being the main service provider (Mogues et al., 2009). Tesfaye et al., (2005) identified three key criteria affecting a farmer's decision when selecting an information source. These were accuracy/reliability, timeliness and accessibility. The most important criteria that influenced choice were the accuracy and reliability of the information source. Farmers ranked extension agents first based on these criteria, followed by radio programmes and then fellow neighbours and farmers.

The numbers of working equids are increasing in many low-income countries, and their importance is being emphasised by increasing human populations, global economic issues and changing environments (Pritchard, 2010). There are estimated to be 2.0 million horses, 0.37 million mules and 5.7 million donkeys working in Ethiopia (Anon, 2012). These play a substantial role in the livelihoods of an Ethiopia population dependent on subsistence agricultural production for income generation (DFID, 2006). Working equids have a direct impact on the lives of individuals and communities by reducing the transport burden for water, fuel, wood and goods (Garuma et al., 2007) and in some areas are also used for the transportation of people and agricultural purposes (Garuma et al., 2007; Gebreab, 1997).

The health, welfare and productivity of working horses, mules and donkeys in Ethiopia are affected by prevalent parasitic and infectious diseases, and problems associated with inadequate management practices (Curran et al., 2005, Pritchard et al., 2005, SPANA, 2005; Yilma et al., 1990). Wounds are one of the commonest health problems to affect working donkeys in many countries (Sells et al., 2009; Burn et al., 2007; Biffa and Woldemeskel, 2006; Curran et al., 2005, Pritchard et al., 2005). Studies of working donkeys in Ethiopia

have identified back sores and wounds as the most commonly observed health problems (Tesfaye and Curran, 2005), with the majority being caused iatrogenically as a result of poor management practices. Farmers in Ethiopia identified a number of immediate impacts from improved donkey health and husbandry. These included: increased use of donkey as transport, hence a reduction in human labour, increase in donkey carrying heavier loads, increased life expectancy of donkeys, reduction in disease and sores on donkeys and the ability to generate extra income through hiring out their donkey (Tesfaye et al., 2005).

There are a variety of approaches to address the health and welfare concerns of working donkeys. One approach is through the education of owners and communities through the provision of information and the improvement of animal health knowledge. In a study by Tesfaye et al., (2005) Ethiopian farmers identified a need for greater knowledge through training, and in transferring improved donkey husbandry technologies to users, the first stage should be changing the attitude of the users in recognising the contribution of donkeys to household economies. Identification of the sources of information regarding donkey care currently used by Ethiopian working donkey users will be beneficial to non-governmental organisations, charities and government departments when deciding how best to disseminate information. Understanding of how information is acquired, and what reliability owners place on it, is an important consideration when designing an educational or extension programme.

With the majority of the Ethiopian population living in a rural location and most rural households owning a donkey, this study aimed to identify the information sources through which rural working donkey owners and users in Ethiopia acquire knowledge about donkey health and welfare. Information about these networks can be used in generating hypotheses regarding the potential acquisition and diffusion of knowledge for improving animal health and welfare.

Materials and Methods

Individual Questionnaires and Group Participatory Situation Analysis (PSA)

Study Area and Participants

The study was carried out in eight sites (rural villages with a donkey owning population) representing a range of agro-ecological zones (Table 1) between January and March 2008.

Sites were selected from two regions in Ethiopia by convenience and were chosen to be approximately representative of other villages which owned donkeys in the regions. Sites were designated as either "exposed" (had previous known exposure to an equine non-governmental organisation (NGO) or equine education/research programme), or "unexposed" (a naive population with regards to the above criteria). The Donkey Sanctuary is one of the veterinary NGOs that operate in these regions. Mobile veterinary clinics visit rural villages and provide veterinary and educational interventions aimed at improving the health and welfare of working donkeys. Of the eight villages, four were categorised as "exposed" and four as "unexposed" (Table 1). Participants were eligible for inclusion in the study if they lived within the chosen village and owned or used a donkey. Participation was entirely voluntarily and owners were free to leave the study at any point. Participants were selected for the study using two different methods. In the villages that were exposed, donkey owners were approached during their attendance at the mobile veterinary clinic. Participants from unexposed villages were recruited using development agents assigned from the relevant Bureau of Agriculture. A total of 80 individuals took part in the group PSA, 10 individuals (two groups of five) taking part from each site, whilst a further 40 individuals also took part in individual interviews (five individuals per site).

Table 1: Information on the villages selected for individual questionnaires and the PSA.

Village Name	Region	Zone	Woreda	Exposed (E) or Unexposed (UE) Village
Debre Zeyit	Oromia	East Shewa	Ada	E
Shashemene	Oromia	West Arsi	Shashemene	UE
Gamo	Oromia	East Shewa	Dugda	E
Sheno	Oromia	North Shewa	Kimbibit	UE
Ziway	Oromia	East Shewa	Batu	UE
Gemeda (Akaki)	Oromia	Addis Ababa Area	Akaki	E
Merino (Akaki)	Oromia	Addis Ababa Area	Akaki	E
Debre Brehan	Amhara	North Shewa	Basuna Warano	UE

Study Design

The individual questionnaire and the group PSA (Table 2) were conducted in either of two regional dialects (Amharic and Afan Oromo) as dictated by the participants preference. One Ethiopian national, who was fluent in Amharic, Afan Oromo and English, acted as both a translator and facilitator. This individual had previous experience in the field of animal health and had received training in participatory approaches. The PSA was based on five

questions in a semi-structured interview (SSI) format, and utilised a number of different methodologies (Table 2 and Appendix 2 and 3). The individual questionnaire and the PSA were piloted with donkey owners from other villages not involved in this study, and questions underwent reverse translation prior to commencing the study. Additional background information (survey site longitude/latitude, participant gender) was also collected.

Table 2: Questions and methodologies used with participants in individual questionnaire and group PSA.

Individual Questionnaire	**Methodology**
Which people do you talk to most often in the village/town/community about horse and donkey care?	Q
Do these people own horses/mules or donkeys?	Q
Are you related to them? (Family/friend/neighbour/co -worker)	Q
How often do you talk about horse and donkey care with them? (Daily/weekly/monthly)	Q
Do you give information/advice freely to other people?	Q
Do people ask you for information/advice by their own initiative?	Q
Who is involved in the day to day care of your horse and donkey (e.g. feeding/water/healthcare/work)?	Q
Group PSA	**Methodology**
Where do you get information/knowledge about horse and donkey health and welfare from?	L,M
How regularly do you receive advice/information? (daily/weekly/monthly)	M
How is this information/advice given to you - verbally/meetings/handouts?	OD
Is there a common meeting place?	OD
How reliable or correct is this information/advice?	OD
Do you freely give this information/advice to others?	OD

Key: Q = Open ended question, L = Listing, M = Matrix, OD = Open Discussion

Questions are direct reverse translations of Afan Oromo versions, and consequently may not read fluently in English.

Data Recording and Analysis

Data were initially translated and recorded in written format by a dedicated recorder in English, and using digital photos of completed matrix boards. Data were entered into a spreadsheet programme and analysed using Microsoft Excel 2007 (Microsoft Cooperation, USA).

Cross Sectional Study

Study Area and Participants

The cross-sectional study was carried out between November 2008 and July 2009 in one of the seven regional zones of Ethiopia (Oromia). Within this region, one zone (Arsi) was selected based upon: a lack of previous exposure to an equine veterinary NGO; a known high density of donkey users; and, logistical considerations. Within this area four woredas (administrative departments) (Sire, Hitosa, Tiyo, Degeluna Tijo) were non-randomly selected based on logistical convenience and a complete list of villages within the woredas was obtained from each woreda agricultural office. Thirty-two villages were randomly selected using random numbers generated in a spreadsheet programme (Microsoft Excel 2007, Microsoft Cooperation, USA). This cross-sectional study was part of a larger ongoing study which needed to minimise contact between participants from different villages (Chapter 4 and Stringer et al., 2011). Consequently, villages were excluded at the selection stage if: there was no road access; the Development Agent (DA) was deemed too inexperienced or new to that village (were unable to identify and contact randomly recruited participants); if there were inadequate villager records; or if selected villages shared a major market at which contamination (mixing of individuals from different villages in study) may occur. Development agents were recruited to liaise with each selected village and to aid in the participant recruitment process. Lists of village inhabitants were obtained from village agricultural offices or municipality offices, and participants in villages were randomly selected using random numbers generated in Microsoft Excel 2007 (Microsoft Cooperation, USA). Participants were eligible for inclusion in the study if they were male, owned or used a donkey, over 18 years of age, and able to attend the study visits. All participants were recruited on a volunteer basis and were free to refuse participation or leave the study at any point. Formal consent was assumed by continued participation in the study after an introduction was administered.

Study Design

Questionnaires were administered on an individual basis by one trained animal health worker (AHW) in either of two regional languages (Afan Oromo and Amharic) in a consistent and controlled manner with no additional clarification (Appendix 4). Questionnaires were extensively piloted and reversed translated. Questionnaires took approximately 20 minutes per participants to complete.

Data Collection

Data collected in this study included participants knowledge (on wounds and wound management in donkeys), and information sources and other relevant information (Table 3). Participants' knowledge (knowledge score) was measured using 12 concise questions. The 12 questions (described in more detail in Chapter 4 and Stringer et al., 2011) required participants to volunteer between one and four correct responses per question, to achieve a total possible maximum score of 28. Participants' information sources were identified along with other relevant information (Table 3). The content of this study questionnaire was informed from information gathered during the individual and group PSA discussions (e.g. the grouping of the information sources utilised by participants for information and advice). Data were initially translated and recorded in written format by a dedicated recorder in English. These data were then entered into a spreadsheet programme (Microsoft Excel 2007, Microsoft Cooperation, USA).

Table 3: Questionnaire administered to 516 participants enrolled in cross-sectional study

Questions *
Of the following people/places, who do you go to for advice about donkeys? (Family/Elders, Friends/Neighbours, Agricultural Office, Peasant/Kebele Association, Traditional Healer, Other)
With what time interval you have discussed with those people/places? (Daily, Weekly, Irregular, Other)
The advice you get from these people/places is reliable/better?
Who is the most knowledgeable person about donkeys in your village?
Do you give advice about donkeys for other people without their asking?
Do other people come to you to get advice about donkeys by their own initiative?
Which of the following task would you perform? (Washing wounds, Cleaning wounds, Healing wounds)
Do people in your village do like you?
Up to what grade you learnt? (Not Educated, Adult Education, Primary, Junior, Higher, Other)
Could you listen to radio programme at the evening and at the morning?
Can you read? (Afan Oromo/ Amharic)
How many donkeys do you own?
Do you own a (horse, mule, cattle/ox, sheep, goat, poultry, dog)?
What is your age?

* Questions are direct reverse translations of Afan Oromo versions, and consequently may not read fluently in English.

Data analysis – Multilevel linear regression

Data were analysed using SPSS v20 (SPSS Inc, Chicago, Illinois, USA), MLwiN v2.25 (Centre for Multilevel Modelling, Bristol, UK) and R (http://www.r-project.org). Multilevel linear

regression models were utilised to determine the effect of variables on knowledge score, allowing for clustering of individuals within villages. The outcome measure for this analysis was a continuous variable reflecting a knowledge score on a questionnaire (out of a maximum of 28). All variables that showed some association with the outcome on univariable analysis (p-value <0.3) were considered during the building of the final multivariable models. A number of variables (cluster group and individual information sources) were correlated; therefore separate models were built with each of these variables. Models were fit using penalised quasi-likelihood with 2nd order Taylor series expansion. A backward-stepwise process utilising the Hosmer-Lemeshow test statistic was used, with covariates remaining in the model if they were statistically significant (p-value <0.05), or if they altered the effect of other covariates by greater than 25%. Random coefficients models, allowing the coefficients for fixed effects, including the intervention, to vary across villages (i.e. random slopes), were assessed to determine if the effects varied by villages. The significance of two-way interaction terms was tested between all fixed effect variables. Model diagnostics included examination of residuals and leverage values, and evaluation of residuals in normal probability plots to check that the residuals at each level followed a normal distribution (Rasbash et al., 2008).

Data analysis – Cluster analysis

Data were analysed using Microsoft Excel 2007 (Microsoft Cooperation, USA) and R (http://www.r-project.org). Cluster analysis was used to explore clusters based on participants' responses to which information sources they contacted. Hierarchical cluster analysis allowed production of graphical outputs, indicating the level of similarity between cluster groups. Cluster analysis was performed using the binary distance measure and the Ward agglomeration method. Cluster groups were identified by visual inspection of the cluster dendrogram and by examination of the distribution of information of sources between the groups when different numbers of groups were selected. The number of clustered groups selected for presentation here was chosen as it most clearly delineated the sources into distinct sets. Subsequent to group identification, the number of participants in each cluster and information source they contacted was calculated.

A comparison of specific variables (e.g. Education level, Literacy, Animal ownership) was performed across cluster groups using a Chi squared analysis. For one variable (Education level), two categories were combined (Higher and Other) due to the small number of

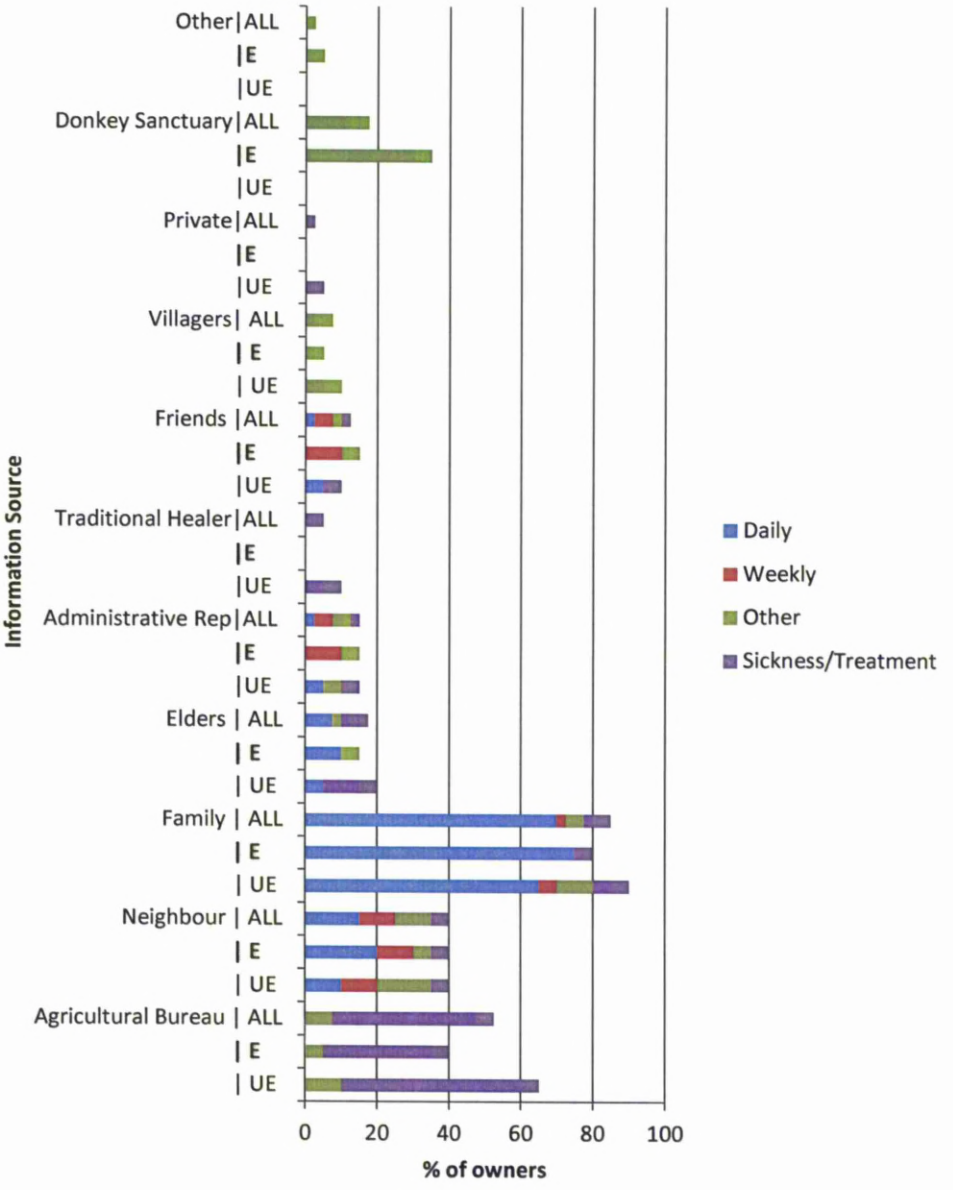
responses in one catergory (Other). This allowed sufficient numbers in each cell to perform a Chi squared analysis.

Results

Individual Questionnaires and Group Participatory Situation Analysis (PSA)

Piloting led to minor modifications to the wording of the interview questions. These modifications were made to ensure that an accurate translation of the researchers intended questions was obtained. During individual interviews owners were asked whether they were sought for information and advice concerning donkey health and husbandry issues. Out of 40 owners asked, 72.5% volunteered that they were sought. Owners were also asked whether they offered advice freely on the same subjects, 85% of owners responded they did so. Owners were asked which people (sources) they talk to most often concerning donkey care (healthcare, husbandry and work issues). Eleven sources were identified across both exposed and unexposed sites (Figures 1 and 2). Owners were also asked how frequently they talked to these sources (Figures 1 and 2).

Figure 1: Information sources volunteered by donkey owners during individual interviews and the frequency of contact with volunteered sources.



E = Exposed sites (n=40), UE = Unexposed sites (n=40), ALL = Exposed and unxposed sites combined (n=80).

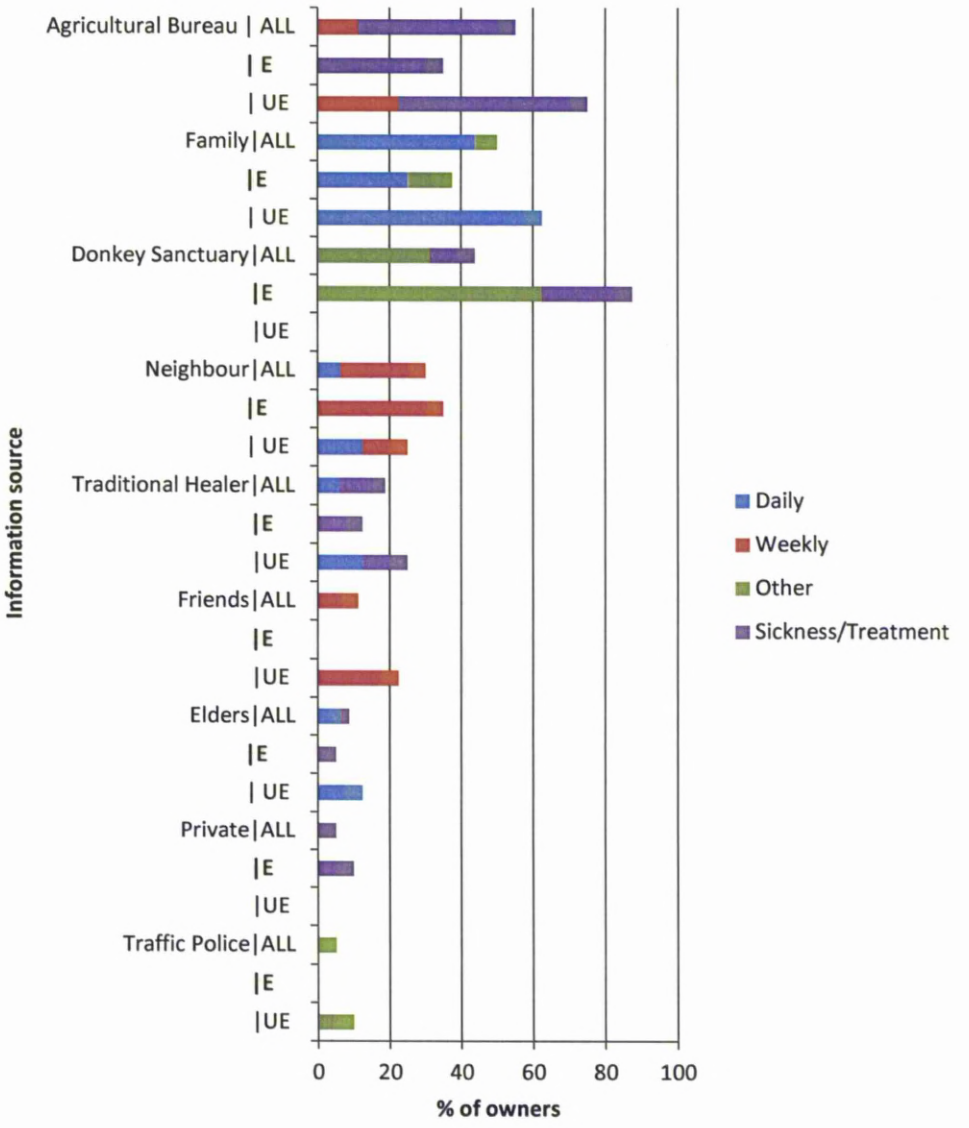
The three most frequently volunteered sources of information for owners in exposed and unexposed areas were family, neighbours and the Agricultural Bureau, although patterns of use of these sources varied. There was a reduction in the percentage of owners

volunteering the Agricultural Bureau in exposed sites compared to unexposed sites, but an increase in those who volunteered The Donkey Sanctuary (an NGO) in exposed sites. No owners volunteered The Donkey Sanctuary in unexposed sites.

The majority of owners talked to their family about their donkey on a daily basis, with many owners also talking to their neighbours about their donkey on a daily or weekly basis (Figure 1). The Agricultural Bureau was talked to by owners predominately when their donkey was sick or required treatment. Neighbours were contacted by a greater percentage of owners in unexposed sites for other and sickness/treatment concerns than in exposed sites, where The Donkey Sanctuary was contacted on an 'other' category basis. Private drug sellers and traditional healers were only volunteered in unexposed sites (where The Donkey Sanctuary were not providing veterinary services), in exposed sites neither of these sources were volunteered.

During the group PSA, nine information sources (for information on donkey healthcare, husbandry and work issues) were volunteered by participants (Figure 2). Owners were also asked how frequently they talked to these sources (Figure 2). Owners were also asked collectively whether they offered advice freely on the same subjects to others, all 16 groups (100%) responded that they did so.

Figure 2: Information sources volunteered by donkey owners during PSA and the frequency of contact with volunteered sources.



E = Exposed sites (n=40), UE = Unexposed sites (n=40), ALL = Exposed and unxposed sites combined (n=80).

The three most frequently volunteered sources of information for owners in exposed areas were: The Donkey Sanctuary, family and the Agricultural Bureau, whilst the three most frequently volunteered sources of information for owners in unexposed areas were: the Agricultural Bureau, family and neighbours. Qualitatively, there was a reduction in the

percentage of owners volunteering the Agricultural Bureau in exposed sites compared to unexposed sites, and The Donkey Sanctuary (an NGO) was only volunteered in exposed sites. The majority of owners talked to their family about their donkey on a daily basis, with the majority of owners also talking to their neighbours about their donkey on a daily or weekly basis (Figure 2). The Agricultural Bureau was talked to by owners predominately when their donkey was sick or required treatment.

Cross Sectional Study

Descriptive results

Piloting led to minor modifications to the wording of the interview questions. These modifications were made to ensure that an accurate translation of the researchers intended questions was obtained. 516 participants were enrolled into the study from four woredas; Sire (n=131), Hitosa (n=126), Tiyo (n=149) and Degluna Tijo (n=110). Participants in the study were asked whether they contacted specific information sources for information or advice about donkeys (Table 4). The most frequently contacted information source was the traditional healer (44.2%), followed by the Agricultural Office (40.3%) and Friends/Neighbours (29.5%). With the exception of the 'Other' information source, there was a significant difference between the knowledge scores of those that contacted and those that did not contact information sources. Knowledge scores were approximately normally distributed (Figure 3) and ranged from zero to 13 with a median score of six.

Figure 3: Distribution of the knowledge scores of donkey owners (n=516) in the crosssectional study

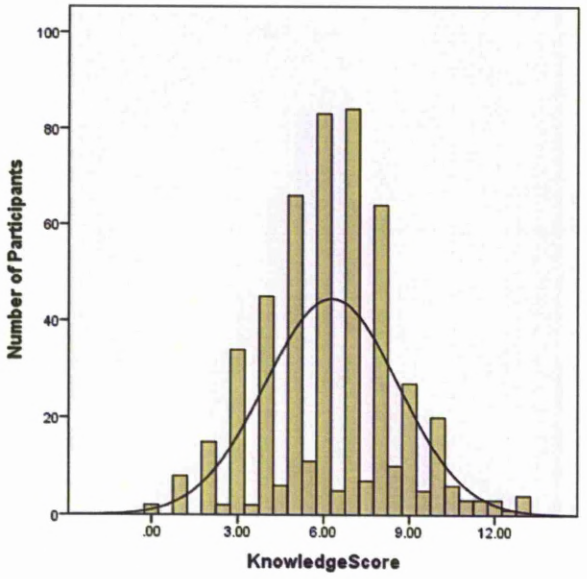


Table 4: Participant response (n=516) and median knowledge scores with regard to whether they contacted a specific information source concerning donkeys and participants literacy ability and radio access,

Information Source	C	NC	Contact Frequency (%)				Perceived Reliability (%)		Median KS		Mann Whitney U (p-value)
	%	%	D	W	I	O	No	Yes	NC	C	
Family/Elders	18.8	81.2	3.5	3.3	10.5	1.6	84.7	15.3	6.00	7.00	0.04
Friends/NB	29.5	70.5	1.6	5.2	19.6	3.1	76.4	23.6	6.00	7.00	<0.001
Agri. Office	40.3	59.7	0.2	2.3	10.7	27.1	61.2	38.8	6.00	7.00	0.02
P/K Ass.	6.2	93.8	0.2	0.8	4.3	1.0	94.2	5.8	6.00	7.00	0.02
Trad. Healer	44.2	55.8	0.0	1.7	9.1	33.3	79.1	20.9	6.00	7.00	0.003
Other	2.5	97.5	0.0	0.0	0.0	2.5	98.1	1.9	6.00	8.00	0.06

Key: KS = Knowledge Score, P/K Ass. = Peasant or Kebele Association, NB = Neighbours,
Agri. Office = Agricultural Office, Trad. Healer = Traditional Healer
C = Contacted, NC = Not Contacted
D = Daily, W = Weekly, I = Irregular, O = Other

Participants were also asked whether they could read either Amharic or Afan Oromo, and whether they had access to listen to radio on a daily basis. Over half of the participants (55.4%) were literate in Amharic, whilst the majority of participants (78.5%) were not literate in Afan Oromo. The majority of participants (80.0%) were able to listen to radio on a daily basis. There was a significant difference between the knowledge scores of those participants that were literate (Unable to read Amharic: Median KS = 5.00; Able to read Amharic, Median KS = 7.00, Mann Whitney U, p-value <0.001), Unable to read Afan Oromo: Median KS = 6.00; Able to read Afan Oromo, Median KS = 7.00, Mann Whitney U, p-value <0.001), and who had radio access compared to those participants that were illiterate and had no radio access (No radio access: Median KS = 5.00; Radio access, Median KS = 6.50, Mann Whitney U, p-value <0.001).

Cluster analysis results

Cluster analysis of the participants based on their volunteered contact with information sources was used to identify six clusters (Table 5 and Figure 4). Cluster descriptors are in Table 5. The largest group of participants (n=154) contacted a mix of sources for information, whilst the smallest cluster (n=43) contacted either the Agricultural Bureau or a Traditional healer for information. Participants in cluster group two (mix of sources) had the joint highest median knowledge score, equal to that of cluster groups 1 and 5, and these three groups clustered together. Participants in cluster three (n=132) did not contact any sources for information and had the lowest median knowledge score.

A comparison of specific variables across cluster groups (e.g. education level, literacy, animal owner ship) is presented in Table 6. A number of these variables were significantly difference across cluster groups, including education level, ability to read Amharic and Afan Oromo, age and knowledge score. The largest percentage of participants in the highest education category were found in cluster two (mix of sources), this cluster also had the lowest percentages of illiteracy to Amharic and Afan Oromo. The largest percentage of participants in the lowest education category were found in cluster three (no sources). The highest percentage of illiteracy to both Amharic and Afan Oromo were also seen in this cluster. The median age of those in cluster three (50.5 years) was over ten years greater than the median age of participants in cluster two (40.0 years). Participants in cluster two were the most likely to be sought for advice (35.7%), whilst also 43.5% of participants in

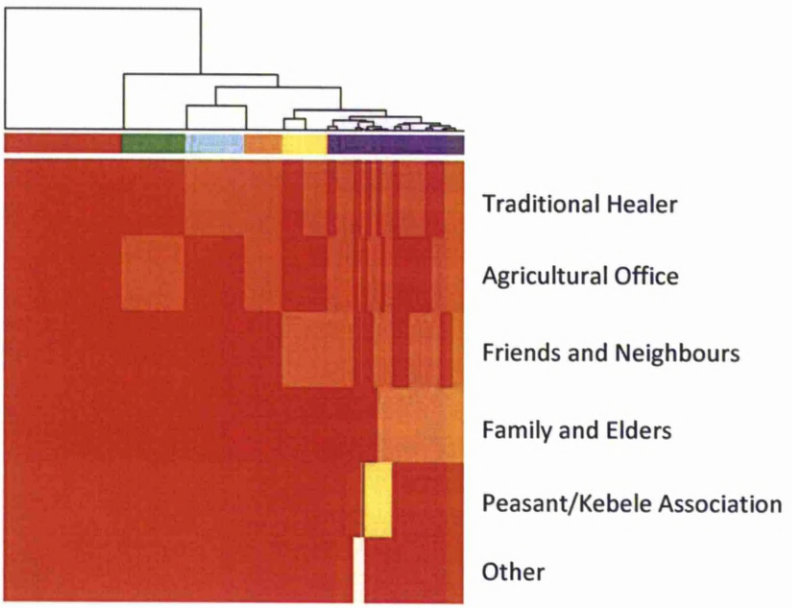
this cluster said they give advice freely. Participants in cluster three were the least likely to be sought for advice (2.3%), with only 2.3% of participants saying they gave advice freely.

Table 5: Breakdown of the sources of information in each cluster group.

Cluster Group	No. of parts. % (n)	Information Source (%)						Cluster Des. #	Med. KS	IQR
		Family and Elders	Friends and NB	AB	PA/Keb Ass.	Trad.	Other			
1	9.7 (50)	0	100	0	0	52	0	Fri/NB /Trad	7.0	3.6
2	29.8 (154)	63	66	61	21	60	8	Mix	7.0	3.5
3	25.6 (132)	0	0	0	0	0	0	None	5.8	3.0
4	13.8 (71)	0	0	100	0	0	0	AB only	6.0	4.0
5	8.3 (43)	0	0	100	0	100	0	AB/Trad	7.0	3.0
6	12.8 (66)	0	0	0	0	100	0	Trad only	6.0	2.0

Key: No. of parts = Number of participants, NB = Neighbours, AB = Agricultural Bureau, PA/Keb = Peasant/Kebele Association, Trad. = Traditional Healer, Med. KS = Median Knowledge Score, IQR = Interquartile range.
Cluster descriptions identify the main information sources within each cluster.

Figure 4: Heatmap diagram* displaying cluster groups and the sources contacted for information.



*The colour represents whether a cluster has contacted a specific source of information. Red = no contact, Other colours (orange, yellow and white) represent contact with source of information, with lighter colour shades representing less contact.

Table 6: Comparison across cluster groups for categorical and continuous data variables for 516 participants in Oromia region, Ethiopia.

				Cluster						Chi square (P-Value)
				1	2	3	4	5	6	
		Median Knowledge Score	Total (n=516)	[Friends/NB /Trad] (n=50)	[Mix] (n=154)	[None] (n=132)	[AB only] (n=71)	[AB and Trad] (n=43)	[Trad only] (n=66)	
			%	%	%	%	%	%	%	
Education Level	No Education	5.0	24.8	20.0	12.3	39.4	23.9	20.9	30.3	<0.001
	Adult Education	5.0	14.3	14.0	13.0	19.0	11.3	14.0	13.6	
	Primary	6.5	33.3	30.0	33.1	31.1	42.3	30.2	33.3	
	Junior	7.0	13.8	22.0	17.5	7.6	11.3	18.6	10.6	
	Higher	8.0	13.6	14.0	23.4	3.0	11.3	16.3	12.1	
	Other (Advanced)	-	0.2	0.0	0.6	0.0	0.0	0.0	0.0	
Literacy (Afan Oromo)	No	6.0	78.5	74.0	71.4	86.4	83.1	81.4	75.8	0.04
	Yes	7.0	21.5	26.0	28.6	13.6	16.9	18.6	24.2	
Literacy (Amharic)	No	5.0	44.6	38.0	31.2	61.4	47.9	39.5	47.0	<0.001
	Yes	7.0	55.4	62.0	68.8	38.6	52.1	60.5	53.0	
Radio Access	No	5.0	20.0	18.0	10.4	27.3	22.5	23.3	24.2	0.1
	Yes	6.5	80.0	82.0	89.6	72.7	77.5	76.7	75.8	
Number of Donkeys	0	6.0	6.0	12.0	3.2	9.8	2.8	2.3	6.1	0.1
	1	6.0	52.1	56.0	50.0	58.3	38.0	55.8	54.5	
	2	6.3	27.9	22.0	31.2	22.0	38.0	30.2	24.2	
	3	6.0	10.3	10.0	10.4	6.1	16.9	9.3	12.1	
	>3	7.0	3.7	0.0	5.1	3.8	4.2	2.3	3.0	
Own Horse	No	6.0	71.1	70.0	69.5	68.2	67.6	86.0	75.8	0.3
	Yes	7.0	28.9	30.0	30.5	31.8	32.4	14.0	24.2	
Own Mule	No	6.0	97.5	100.0	96.8	97.0	97.2	97.7	98.5	0.8
	Yes	5.0	2.5	0.0	3.2	3.0	2.8	2.3	1.5	
Own Cattle	No	5.0	6.4	6.0	4.5	9.8	4.2	4.7	7.6	0.5
	Yes	6.0	93.6	94.0	95.5	90.2	95.8	95.3	92.4	
Own Sheep	No	6.0	37.0	34.0	32.5	37.1	36.6	39.5	48.5	0.4
	Yes	6.0	63.0	66.0	67.5	62.9	63.4	30.5	51.5	

Table 6 (Continued): Comparison across cluster groups for categorical and continuous data variables for 516 participants in Oromia region, Ethiopia.

				Cluster (%)						
				1	2	3	4	5	6	
		Median Knowledge Score	Total (n=516)	[Friends/NB /Trad] (n=50)	[Mix] (n=154)	[None] (n=132)	[AB only] (n=71)	[AB and Trad] (n=43)	[Trad only] (n=66)	Chi square (P-Value)
Own Goat	No	6.0	74.2	76.0	74.0	80.3	64.8	74.4	71.2	0.3
	Yes	6.0	25.8	24.0	26.0	19.7	35.2	25.6	28.8	
Own Dog	No	6.0	27.9	24.0	24.0	31.1	21.1	27.9	40.9	0.1
	Yes	6.0	72.1	76.0	26.0	68.9	78.9	72.1	59.1	
Own Poultry	No	6.0	21.9	20.0	18.2	28.8	15.5	25.6	22.7	0.2
	Yes	6.0	78.1	80.0	81.8	71.2	84.5	74.4	77.3	
Sought Advice	No	6.0	85.1	76.0	64.3	97.7	97.2	97.7	93.0	<0.001
	Yes	7.0	14.9	24.0	35.7	2.3	2.8	2.3	6.1	
Give Advice	No	6.0	78.7	50.0	56.5	97.7	94.4	88.4	90.9	<0.001
	Yes	7.0	21.3	50.0	43.5	2.3	5.6	11.6	9.1	
Wash Wounds	No	6.0	49.8	38.0	39.6	68.9	45.1	37.2	57.6	<0.001
	Yes	7.0	50.2	62.0	60.4	31.1	54.9	62.8	42.4	
Clean Wounds	No	6.0	48.4	34.0	39.6	68.2	43.7	34.9	54.5	<0.001
	Yes	7.0	51.6	66.0	60.4	31.9	56.3	65.1	45.5	
Heal Wounds	No	6.0	37.6	24.0	28.6	58.3	31.0	25.6	42.4	<0.001
	Yes	6.5	62.4	76.0	71.4	41.7	69.0	74.4	57.6	
Wash+Clean Wounds	No	6.9	45.5	30.0	36.4	67.4	38.0	32.6	51.5	<0.001
	Yes	7.0	54.5	70.0	63.6	32.6	62.0	67.4	48.5	
				Years						
Age	Mean		45.66	46.02	42.32	49.30	45.48	43.67	47.41	K-Wallis (P value 0.01
	Median		45.00	43.50	40.00	50.50	43.00	40.00	47.50	
	Per. (25)		33.00	30.00	31.50	35.00	36.00	32.00	32.75	
	Per. (75)		57.00	60.50	51.00	61.75	56.00	55.00	58.00	
				Knowledge Score						
Knowledge Score	Mean		6.28	6.87	6.95	5.49	6.04	6.47	5.99	K-Wallis (P value <0.001
	Median		6.00	7.00	7.00	5.75	6.00	7.00	6.00	
	Per. (25)		5.00	5.00	5.00	4.00	4.00	5.00	5.00	
	Per. (75)		6.00	8.63	8.50	7.00	8.00	8.00	7.00	

Per. = Percentiles

Multilevel linear regression analysis

The explanatory variables selected by univariable screening for consideration in the multilevel models were those variables that showed some association (p-value <0.3) with the outcome variable, knowledge score (Table 7). As there was correlation between cluster group and information source, different models were produced including these variables as fixed effect variables at the start of the model build. During the analysis, the focus was on the cluster group model. The first model (Model 1) considered the effect of cluster group as a fixed effect variable on knowledge score, after excluding information source as a variable for consideration (Table 8). The final variables that had a significant effect on the outcome variable were formal education level, cattle ownership, whether a participant gives advice and washes and cleans wounds on his donkey. Cluster groups did not have a significant effect on the outcome variable in the final model. Due to the association between education level and cluster group a second model (Model 2) was considered. In this model the education level variable was not included and the cluster group variable forced in as a fixed effect. Without the education level variable in the model, the cluster group variable was significantly associated with the outcome variable. There were no significant interaction terms between fixed effect variables in either models. Almost all of the variance in both models could be attributed to differences between individuals rather than between villages. Random slopes in both models were not significant. Normal probability plots in both models of the individual and village level residuals showed that the assumption of normality was reasonable.

Table 7: Univariable analysis of variables associated with knowledge level about wounds in donkeys in 516 rural donkey owners. The outcome variable was knowledge score (a continuous score with a maximum of 28).

Variable		Coefficient	SE	Lower 95% CI	Upper 95% CI	P-value
Age		-0.038	0.006	-0.0498	-0.0262	<0.01
Formal Education	**No Education**	Ref				
	Adult Education	0.881	0.302	0.2891	1.4729	<0.001
	Primary	1.711	0.242	1.2367	2.1853	
	Junior	2.366	0.307	1.7643	2.9677	
	Higher	3.014	0.307	1.335	4.36	
Own Radio	**No**	Ref				
	Yes	0.997	0.252	0.5031	1.4909	<0.001
Read O	**No**	Ref				
	Yes	1.346	0.241	0.8736	1.8184	<0.001
Read A	**No**	Ref				
	Yes	1.618	0.193	1.2397	1.9963	<0.001
Number of Donkeys	**0**	Ref				
	1	0.403	0.438	-0.4555	1.2615	0.6
	2	0.546	0.457	-0.3497	1.4417	
	3	0.649	0.523	-0.3761	1.6741	
	>3	0.039	0.675	-1.2840	1.3620	
Family and Elders	**No**	Ref				
	Yes	0.747	0.259	0.2394	1.2546	0.004
Friends and Neighbours	**No**	Ref				
	Yes	0.963	0.219	0.5338	1.3922	<0.001
Agri. Office	**No**	Ref				
	Yes	0.434	0.208	0.0263	0.8417	0.04
Peasant/Kebele Ass.	**No**	Ref				
	Yes	0.867	0.422	0.0399	1.6941	0.04
Trad. Healer	**No**	Ref				
	Yes	0.625	0.204	0.2252	1.0248	0.002
Other	**No**	Ref				
	Yes	1.251	0.647	-0.0171	2.5191	0.05
Own Horse	**No**	Ref				
	Yes	0.430	0.228	-0.0169	0.8769	0.06
Own Cattle	**No**	Ref				
	Yes	1.489	0.411	0.6834	2.2946	<0.001
Own Mule	**No**	Ref				
	Yes	-0.596	0.648	-1.8661	0.6741	0.4
Own Sheep	**No**	Ref				
	Yes	0.063	0.214	-0.3564	0.4824	0.8
Own Goat	**No**	Ref				
	Yes	-0.120	0.236	-0.5826	0.3426	0.6
Own Dog	**No**	Ref				
	Yes	0.432	0.228	-0.0149	0.8789	0.06
Own Poultry	**No**	Ref				
	Yes	0.509	0.245	0.0288	0.9892	0.04

Table 7 Continued: Univariable analysis of variables associated with knowledge level about wounds in donkeys in 516 rural donkey owners. The outcome variable was knowledge score (a continuous score with a maximum of 28).

Variable		Coefficient	SE	Lower 95% CI	Upper 95% CI	P-value
Cluster	**3**	Ref				
	1	1.386	0.371	0.6588	2.1132	<0.001
	2	1.452	0.266	0.9306	1.9734	
	4	0.558	0.329	-0.0868	1.2028	
	5	0.988	0.393	0.2177	1.7583	
	6	0.508	0.338	-0.1545	1.1705	
Sought Advice	**No**	Ref				
	Yes	0.538	0.285	-0.0206	1.0966	0.06
Give Advice	**No**	Ref				
	Yes	1.111	0.243	0.6347	1.5873	<0.001
Wash Wounds	**No**	Ref				
	Yes	0.725	0.201	0.3310	1.1190	<0.001
Clean Wounds	**No**	Ref				
	Yes	0.736	0.202	0.3401	1.1319	<0.001
Heal Wounds	**No**	Ref				
	Yes	-0.545	0.209	-0.9546	-0.1354	0.01
Wash + Clean Wounds	**No**	Ref				
	Yes	0.708	0.203	0.3101	1.1059	<0.001

Table 8: Multilevel, multivariable linear regression model showing variables that influence owner knowledge score. The outcome variable was knowledge score (a continuous score with a maximum of 28).

		Model 1			Model 2		
Variable		**Coeff**	**SE**	**P-value**	**Coeff**	**SE**	**P-value**
Formal Education	**No Education**	Ref					
	Adult Education	0.827	0.296	<0.001			
	Primary	1.550	0.240				
	Junior	2.144	0.304				
	Higher	2.732	0.307				
Own Cattle	**No**	Ref			Ref		
	Yes	0.961	0.369	0.009	1.334	0.396	<0.001
Give Advice	**No**	Ref			Ref		
	Yes	0.644	0.225	0.004	0.598	0.269	0.03
Wash + Clean Wounds	**No**	Ref			Ref		
	Yes	0.415	0.184	0.02	0.394	0.203	0.05
Cluster	**3**				Ref		
	1				0.897	0.391	0.02
	2				1.016	0.288	
	4				0.336	0.328	
	5				0.714	0.392	
	6				0.362	0.332	

Coeff = Coefficient

To further explore the potential correlation between cluster group and education level, the calculated deviance of the observed counts from the expected counts was determined using the following formula: (Observed-Expected)/Expected (Table 9). Differences between the expected number of participants and the observed number of participants in each education level were found for all cluster groups. For cluster group three, there was a greater than expected (highlighted blue) number of participants in the lower education levels, with a lower than expected number of participants in the higher education levels. The reverse of this observation was seen in cluster group two.

Table 9: Comparison of calculated deviance from expected counts between cluster group and education level.

		Cluster Group					
Education Level		**1**	**2**	**3**	**4**	**5**	**6**
No education	**Count**	10.0	19.0	52.0	17.0	9.0	20.0
	Expected Count	12.3	37.9	32.5	17.5	10.6	16.2
	(O-E)/E	-0.2	-0.5	0.6	0.0	-0.1	0.2
Adult education	**Count**	7.0	20.0	25.0	8.0	6.0	9.0
	Expected Count	7.3	22.4	19.2	10.3	6.3	9.6
	(O-E)/E	0.0	-0.1	0.3	-0.2	0.0	-0.1
Primary	**Count**	15.0	51.0	41.0	30.0	13.0	22.0
	Expected Count	16.7	51.3	44.0	23.7	14.3	22.0
	(O-E)/E	-0.1	0.0	-0.1	0.3	-0.1	0.0
Junior	**Count**	11.0	27.0	10.0	8.0	8.0	7.0
	Expected Count	6.9	21.2	18.2	9.8	5.9	9.1
	(O-E)/E	0.6	0.3	-0.4	-0.2	0.4	-0.2
Higher	**Count**	7.0	37.0	4.0	8.0	7.0	8.0
	Expected Count	6.9	21.2	18.2	9.8	5.9	9.1
	(O-E)/E	0.0	0.7	-0.8	-0.2	0.2	-0.1

(O-E)/E = (Observed-Expected)/Expected

Discussion

A greater understanding of the existing formal and informal information sources and knowledge-transfer networks of rural farmers could potentially improve the development of appropriate extension approaches that facilitate knowledge transfer and innovation adoption (Tesfaye et al., 2005). The lack of effective extension dissemination routes has been cited as one of the major problems for Ethiopian agriculture (Aberra et al., 1996, cited by Tesfaye et al., 2005). One cause for low agricultural productivity has been stated as the low education level of farmers and lack of access to new knowledge developed by farmers, researchers or agri-business companies (van den Ban, 2002). Knowledge is an important input in development, especially for people with limited access to material resources such as land and capital (Ramkumar et al., 2007), and has an important role in decreasing poverty among farmers by increasing their ability to use human and social capital to form sound opinions and make good decisions (van den Ban, 2002). Individuals (including farmers) may seek information from any number of sources to aid decision making to improve the health and productivity of the animals they own.

Participants in this study in both the individual interviews and the group PSA volunteered numerous sources of information regarding health and husbandry advice for donkeys. These included sources such as friends, family and neighbours (likely to represent strong ties) and those such as the government agricultural bureau, private veterinary surgeons and external veterinary NGOs (likely to represent weak ties). Van den Ban and Hawkins, (1996) state that informal communication networks (such as those with friends and neighbours) are an especially important source of information. Granovetter, (1973) argued that weak ties (people loosely connected to others in the network) were necessary for diffusion to occur across subgroups within a system. The findings in this current study are similar to a study by Sseguya et al., (2012), in which rural community members in Uganda accessed information on a range of rural issues from an array of sources. Another study by Hogset, (2005) with Kenyan smallholders found that all respondents listed family, neighbours and friends as network members, with friends being people the respondent 'likes to discuss issues of farming with'. Better informed farmers living in the neighbourhood were found to be important sources of information for other farmers, with farmers meeting each other regularly during social affairs, creating an opportunity for them to discuss agricultural technology and other issues (Tesfaye et al., 2005). In both the individual interviews and the group PSA, the frequency of contact (for donkey health and husbandry information) differed between the volunteered information sources. This is likely to be a result of the differing information needed from each source, and the availability of access to each source, with for example, a daily seeking of advice on general care (e.g. feeding and use) and an irregular seeking of advice for health care concerns.

In both the individual interviews and the group PSA there was a reduction in percentage of owners who volunteered the agricultural bureau as a source of information when there was access to an external veterinary NGO. This may be a result of the increased reliability owners perceive in NGOs, as demonstrated by Sseguya et al., (2012), where NGOs were rated highly by communities because of their timeliness, good quality and regular follow up, compared to governmental departments. It may also be a result of the services being offered with no cost to owners by the NGO. In both the individual interviews and the group PSA there were also very few owners who volunteered the 'private' veterinary/pharmacy information source, and only volunteered it when their donkey was sick or needed treatment. When this was discussed further with owners, many responded that the private drug sellers were only interested in making money and sometimes sold out of date and ineffective drugs. This was consistent with previous findings that information from private

businesses was rated low in terms of reliability, as sellers tended to supply fake products (seeds) and were keen to gain bigger profit margins (Sseguya et al., 2012). The provision of free services (veterinary and education) in certain locations by an NGO has the potential to create dependency on free services, undermine local service providers (governmental agricultural bureaus) and disrupt local farmer-to-farmer exchange systems (Pritchard, 2010; Seboka and Deressa 1999). Where an external veterinary NGO is currently working, this was associated in the present study with a reduction in the percentage of owners who use the services of the agricultural bureaus and instead favour those of the veterinary NGO.

We found that 80.0% of owners had access to radios on a daily basis, although we did not ascertain whether owners used this as a source of information. Average radio ownership across three sites in the study by Tesfaye et al., (2005) was 49.3%. The differences in these figures might be due to more people accessing radio programmes than own radios, with individuals often listening to a communal or family radio rather than owning a radio individually. This channel has been previously used to effectively communicate information (De Silva and Garforth, 1997; Valente et al., 1994), and has the potential to be a useful source of information for farmers in this region.

There are a number of social networks that exist between farmers in Ethiopia. These indigenous social networks are perhaps reinforced by the most significant traditional institution called Edir, which serves as a platform for members to inform each other about recent development and other emerging issues in farming and social affairs (Seboka and Deressa, 1999). In the study by Tesfaye et al., (2005), the vast majority of farmers (94%) were members of at least one social institution, and this has been suggested as one possible route for the dissemination of agricultural interventions. Davis et al., 2004 recommended the use of farmer groups for dissemination of information. In this current study, information was only sought by 6.2% of owners from Peasant/Kebele Association, with the majority (94.2%) of owners feeling this information was not reliable. This study did not try to identify whether owners sought information from other social institutions or farmer groups.

Only males were selected for inclusion (discussed in Chapter 4 and Stringer et al., 2011) as pilot work (and previous studies: Tesfaye et al., 2005; Marshall and Ali, 1997; Campbell, 1994) had indicated that there was a male dominant hierarchy within Ethiopian households, and that males would most likely be the household head. Male-headed

households are more likely to get information about new technologies and undertake risky businesses than female-headed households (Asfaw and Admassie, 2004).

The participants in this study (individual questionnaires, PSA and cross-sectional study) were all rural donkey owners. The villages and the owners who participated in the individual questionnaires and the PSA were deemed to be representative of other rural villages and working donkey owners in the region. However, there is potential for selection bias as no random sampling process was utilised to select either the villages or owners in these first two studies, and owners who volunteered to participate in these studies may differ in some way from those who did not want to participate. Both of these issues could potential lead to the villages and owners being a non representative sample of the intended target population. In the cross-sectional study, both villages and owners (rural donkey owners) were randomly selected and therefore should be representative of other rural donkey owners in the region. All three studies involved rural donkey owners and therefore the results are unlikely to be generalisable to owners of other working equid species (e.g. working horse owners who live in urban and peri-urban locations).

In the cross-sectional study, the percentage of owners who contacted specific information sources differed widely. The majority (81.4%) of participants in the cross-sectional survey responded they seek information on these subjects from at least one source. The contact with these sources for the most part was on an irregular and needs basis, most likely seeking information and advice for healthcare and illness concerns. One of the most interesting findings was participant's opinion of the reliability of these sources with regards to the information they provide. For those seeking information from peasant or kebele associations, only 5.8% thought the advice they receive is reliable. Whilst only 20.9% and 38.8% of participants think the advice they receive from the traditional healer (the most frequently contacted information source) and agricultural bureau (the second most frequently contacted information source) respectively is reliable. In a study by Tesfaye et al., (2005), farmers facing problems relating to agriculture consulted extension agents first for advice and information, and approximately 80% were satisfied with the services provided. Whilst this current study reveals largely similar results to the study by Tesfaye et al., (2005) with regards to information sources contacted, there was a difference in the percentages of farmers who perceive each information source to be reliable. These low percentages highlight a real concern of owners as to the reliability of the information they are being provided. This is of concern, as the most important criteria for famers with

regards to information supply is likely to be reliability and accuracy (Tesfaye et al., 2005). Sseguya et al., (2012) stated that reliability of the information goes hand in hand with its application, with most of the information that was perceived as unreliable also being reported as difficult to apply.

Cluster analysis of the participants based on their volunteered contact with information sources suggested six clusters (each representing a type of individual based on those that seek different information sources). All clusters, except one, contacted at least one source for information regarding donkey health and husbandry. Only one cluster (cluster group 3, n=132) contacted no information sources, whilst the majority of participants in this study (cluster group 2, n=154) contacted a number of information sources. Given the low status of the donkey within the majority of rural Ethiopian communities and the lack of healthcare provided for them it is unlikely that farmers in this study cluster together as a result of their knowledge on wounds and wound management in donkeys. In a study by Valente, (1997) looking at contraceptive use in Cameroonian women, it has been demonstrated that 'birds of a feather flock together', that women cluster in networks with others like themselves (with regards to age, education level and wealth). Therefore, a more likely explanation in this study was that farmers were in clusters with individuals who were more similar to each other as result of other demographic characteristics, such as education level or cattle ownership, rather than their knowledge concerning donkey healthcare.

A number of variables (cluster group and the specific information sources) were highly correlated as the cluster group variable was formed based on the information sources a participant contacted. Therefore only one variable (cluster group) was included in the multilevel linear regression model. The cluster groups were mutually exclusive (i.e. people only belonged to one cluster group) whereas there was likely to be some correlation between information sources (i.e. many people from different cluster groups contacted a specific information source). In this study, knowledge score increased in clusters that contained more information sources and seeking information from multiple sources was associated with greater knowledge. This study did not attempt to validate the content or quality of the information provided by each information source. Hence, with regards to knowledge score, it may be that specific sources were important, or that there was something different about individuals who seek information or seek it more widely. Other variables which were associated with a greater knowledge score were: educational level, giving advice, washing/cleaning wounds and cattle ownership.

Age, education level, and gender of household head are just some of the important factors associated with agricultural technology adoption decisions (Nguthi, 2008). The average age of the household head was 48 years in a study by Tesfaye et al., (2005), which was similar to that in the current study, where the mean age was 46 years. Younger individuals may be more knowledgeable about newer practices and willing to bear risk due to longer term planning, however older individuals have more experience, resources and authority that allows them to decide positively on agricultural adoption (Nguthi, 2008). In this current study, we found that older participants had lower knowledge scores. Tesfaye et al., (2005) state that assessment of age structure is useful because it has an implication for the transfer, adoption and use of agricultural technologies.

In this study, knowledge score increased as education level increased. It has been suggested that an understanding of the education level of the intended recipients in important when designing and developing appropriate pathways for any technology transfer or dissemination (Tesfaye et al., 2005). Educated farmers are said to be early adopters of technology, with education potentially making farmers more receptive to technical recommendations that require a certain level of literacy (Nguthi, 2008). Weir and Knight (2000) found that household-level education is important to timing of adoption, with educated farmers being early innovators, providing a better example, which may be copied by less-educated farmers. Educated farmers are also better able to copy those who innovate first, enhancing the diffusion of new technology more widely within a site. A previous study in central Ethiopia has found that 23% of household heads were able to read and write through informal sources (adult education programmes), whilst 38% of household heads had undergone formal education (primary education or greater). Tesfaye et al., (2005) also revealed that 39% of household heads have never received any education as a result of economic, cultural and institutional problems. In the current study, only 14.3% of individuals had received an adult education programme, 60.9% of individuals had undergone formal education (primary level or greater), and 24.8% of individuals had never received any education. This increase in household heads having received more formal education is more likely to be due to differences in the geographical locations of the two studies rather than a chronological effect (given the average age of participants in both studies are very similar and that the studies were carried out in 2005 and 2008). Therefore any recent changes in education would be unlikely to have filtered through to household heads. If education levels vary geographically, there is a need to carefully consider the utilisation of different interventions in different areas.

In the individual interviews and the group PSA, 85% and 100% of participants, respectively, said they gave advice to others on health and husbandry issues concerning donkeys, with only 21.3% of participants in the cross-sectional study saying that they freely gave others advice on these subjects. The authors are unaware of any specific reason why these results differ between studies, although the group dynamics of the PSA study may potentially have some effect on participant's response. This study did not attempt to evaluate reciprocity in information networks and therefore this information was not validated. Livestock ownership has been used to represent wealth, and it is regularly hypothesized that the adoption of agricultural technologies requires sufficient financial wellbeing (Knowler and Bradshaw, 2007). A previous study by Pearson et al., (2001) identified that 99% of rural donkeys owners also kept cattle, compared to this study where 94% of donkeys owners owned cattle. The mean education level was higher in individuals who owned cattle (mean education level = 1.82) compared to those that did not own cattle (mean education level = 1.09), although this difference was not significant. The significance between cattle ownership and increased knowledge score in the current study might be explained by the fact that individuals who own cattle may be wealthier, and may also know more about general animal healthcare. That individuals that already wash and clean wounds on their donkeys had an increased knowledge score may reflect reverse-causality, with this behaviour being due to the greater level of knowledge. The relationship between knowledge and individual variables, such as education level, animal ownership, wealth and farmer behaviour is complex and requires further investigation to fully understand and identify potential casual pathways.

Conclusion

Participants in this study contacted numerous sources for information about donkey health and husbandry issues. The main sources contacted were: traditional healers, governmental agricultural offices and friends/neighbours. Sources were contacted on a predominately irregular basis and were largely deemed to be unreliable with regards to the information they provided. A number of variables were associated with knowledge score, including sources of information, cluster group (derived from sources of information) and educational level. It may be necessary to use different sources and channels to transfer and disseminate information to differing individuals. The relationship between specific farmer

variables and animal health knowledge is complex and further work is required to fully understand possible casual pathways.

CHAPTER FOUR:

A cluster-randomised controlled trial to compare the effectiveness of different knowledge-transfer interventions for rural working equid users in Ethiopia

This chapter has been published as a paper:

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Abstract

There have been few studies evaluating the efficacy of knowledge-transfer methods for livestock owners in developing countries, and to the authors' knowledge no published work is available that evaluates the effect of knowledge-transfer interventions on the education of working equid users. A cluster-randomised controlled trial (c-RCT) was used to evaluate and compare the effectiveness of three knowledge-transfer interventions on knowledge-change about equid health amongst rural Ethiopian working equid users. Groups were exposed to either; an audio programme, a village meeting or a diagrammatic handout, all of which addressed identical learning objectives, and were compared to a control group which received no intervention. Thirty-two villages were randomly selected and interventions randomly assigned. All participants in a village received the same intervention. Knowledge levels were assessed by questionnaire administration. Data analysis included comparison of baseline data between intervention groups followed by multilevel linear regression models (allowing for clustering of individuals within village) to evaluate the change in knowledge between the different knowledge-transfer interventions.

A total of 516 randomly selected participants completed the pre-intervention questionnaire, 504 of whom undertook the post-dissemination questionnaire, a follow-up response rate of 98%. All interventions significantly improved the overall 'change in knowledge' score on the questionnaire compared to the control, with the diagrammatic handout (coefficient (coef) 9.5, S.E = 0.6) and the village meeting (coef 9.7, S.E = 0.6) having a significantly greater impact than the audio programme (coef 4.8, S.E = 0.6). Covariates that were different at baseline, and which were also significant in the final model, were age and pre-intervention score. Although they had a minimal effect on the intervention coefficients there was a significant interaction between age and intervention. This study should aid the design of education materials for adult learning for working equid users and other groups in developing countries.

Introduction

There are estimated to be 1.8 million horses, 377,000 mules and 4.3 million donkeys working in Ethiopia, the largest population of donkeys in Africa and the second largest donkey population in the world after China (Anon, 2007). Their role in the socio-economics of the country is substantial, with the majority of the Ethiopian population dependent on

traditional subsistence agricultural production (DFID, 2006). Livelihoods are predominantly based on agriculture, which accounts for 85% of employment, 45% of national income and over 90% of export earnings, but Ethiopian agriculture still remains low-input, low-value and subsistence-orientated (DFID, 2006). Equids are used for the transportation of goods, people and in some areas for agricultural purposes (Garuma et al., 2007; Gebreab 1993). They have a direct effect on the lives of rural people by reducing the transport burden of water, fuel wood and goods (Garuma et al., 2007). Although often considered a secondary animal in relation to oxen, donkeys provide an effective entry point for assisting women in both domestic responsibilities and income generating activities (Marshall and Ali, 1997).

Working equids in Ethiopia suffer from low productivity as a result of prevalent parasitic and infectious disease, low nutritional standards and poor management practices (Yilma et al., 1990). These causes contribute to the short life span of Ethiopian donkeys (9-13 years) compared to a possible 37-40 years in the UK (Svendsen, 1994). Due to their perceived low social status, and their single purpose role within farming systems, few farmers keep more donkeys than are needed to fulfil their immediate work requirements (Tesfaye and Smith, 2000). Farmers who do not own a donkey have a relatively weak economic base compared to those who own donkeys, and also own fewer other livestock (Alemayehu et al., 2000).

Wounds are amongst one of the commonest health concerns to afflict working donkeys in many countries (Sells et al., 2009; Burn et al., 2007; Biffa and Woldemeskel 2006; Curran et al., 2005, Pritchard et al., 2005). In addition, studies of donkeys in Ethiopia have demonstrated that back sores and wounds are the most commonly observed health problem (Tesfaye and Curran, 2005). The majority of these wounds are a result of man-made causes, which is in contrast to the majority of wounds on equids in developed countries that are predominantly due to accidental injury. Wounds in working donkeys are seen on the legs, girth, tail, saddle and wither regions (Sells et al., 2009; Pritchard et al., 2005). These wounds are often caused by a combination of poorly fitting and designed tack or harnesses, beating with sticks and improper management practices (Pearson et al., 2003). Differences in wound severity and location can often be attributed to the different uses of the donkeys: for example, they may be ridden, carry packs or be used for draught, and also to differences in saddle and harness design (Sells et al., 2009).

One approach to decrease the prevalence of wounds is through education of donkey users. Ethiopian farmers have themselves identified a need for greater knowledge through

training (Tesfaye et al., 2005). However, there is limited published work available that evaluates the impact of different knowledge-transfer methods on adult learning in developing countries, and to the authors' knowledge no published work is available that evaluates the effect of knowledge-transfer interventions on the education of working equid users. A variety of knowledge-transfer methods have been widely used for educating people in the developing world including: handouts and leaflets (Tu and Giang, 2002); rural radio (Chapman et al., 2003; De Silva and Garforth, 1997; Valente et al., 1994); drama (Soldan 2004; Harvey et al., 2000); video (Rimm, 2003); information and communication technology (ICT) (Dawson and Joof, 2005) and community educators (Klepp et al., 1997). However, few studies have utilised randomised controlled trials to assess the impact of knowledge-transfer interventions on their target audience (Grace et al., 2008; Bell et al., 2005; Kelly et al., 2003; Thomas et al., 2003; Eaden et al., 2002). The objectives of this study were to develop a number of different knowledge-transfer interventions for rural working equid users in Ethiopia and, subsequently, to assess the efficacy of these on knowledge change using a c-RCT.

Materials and Methods

Content and design of knowledge-transfer interventions

Both the focus of the education programme, and the design of the knowledge-transfer interventions were informed by a Participatory Situation Analysis (PSA) (Stringer et al., 2009). The PSA gathered information on the perceptions of working equid owners about the health and disease concerns of their animals, and their existing contact and social networks. The PSA identified wounds as an important owner-perceived concern about their donkeys. This information was then triangulated with both clinical records from a veterinary non-governmental organisation (NGO) involved in providing free veterinary care for working equids in Ethiopia, and with available published literature. Results of the triangulation process informed the development of 10 learning objectives (Table 1 and Appendix 5), which were designed to address key issues associated with wounds and wound management in donkeys, including their causes, sites, treatment, prevention and relevance.

Table 1: Learning objectives used to develop knowledge-transfer interventions on the topic of wounds and wound management in donkeys in Ethiopia.

	LEARNING OBJECTIVES
1	Be able to list 4 causes of manmade wounds.
2	Identify 4 common sites/areas affected by manmade wounds.
3	Be aware of good and bad topical treatments for wounds.
4	Describe how to prepare an appropriate salt solution for cleaning wounds.
5	Be able to list 3 steps involved in cleaning wounds appropriately.
6	Recognise 2 signs of an early harness wound.
7	Select appropriate material as a base layer for the harness.
8	Describe 3 important features of the padding on the harness.
9	Describe an important feature of harness base layer care.
10	Recognise 3 disadvantages of your donkey having wounds.

These 10 learning objectives were then incorporated into the design and development of three different knowledge-transfer interventions; an audio programme (A), a village meeting facilitated by an animal health worker (VM) and a diagrammatic handout (HO). The interventions chosen for inclusion in the c-RCT were informed by results of other relevant published studies, and future sustainability, economics and logistical considerations. All interventions were designed with content that was both culturally and socially acceptable, and affordable. Each intervention underwent extensive phases of pretesting, piloting and reverse translation prior to release to study participants. The diagrammatic handout was designed to be predominately image-based with as little text as necessary, having taken into consideration the low levels of literacy and visual literacy identified amongst study participants during the PSA and pretesting phase. The handout consisted of four laminated colour pages of A4 paper (Appendix 6), containing high quality photos with background detail removed using Adobe Photoshop CS2. Text on the handout was limited to single words or short sentences in Afan Oromo (regional language of the Oromia region). The handout was distributed to participants on an individual basis at the end of the pre-intervention questionnaire, and was not accompanied by any discussion or clarification of the content.

The audio programme was developed in the format of a short (12 minute) radio drama which comprised of a discussion in Afan Oromo between a wise old livestock owner and a young, inexperienced owner, and was recorded by recognised local radio actors (See Appendix 7 for scripts). This programme was recorded using digital software (Audacity

1.2.6, http://audacity.sourceforge.net) and was broadcast via an MP3 player and loudspeakers to all participants in a village on a group basis, following administration of the pre-intervention questionnaire. The village meeting consisted of a standardised talk accompanied by both visual 'poster' displays and demonstrations given by one local, qualified animal health worker in Afan Oromo (See Appendix 8 for script and images). It was delivered to all participants in a village as a group after the pre-intervention questionnaire, and also involved a short question and answer session for clarification at the end of the meeting which could be in either Afan Oromo or Amharic.

Design of c-RCT

A c-RCT design was used to compare the effects of the three knowledge-transfer interventions with a control group (that received no knowledge-transfer intervention) on change in knowledge of equid users. Villages (Kebeles) and rural donkey users were randomly selected and the same intervention was randomly assigned to all participants within each village. Cluster randomisation was necessary to prevent "contamination" between owners belonging to one village via sharing of information. Identical questionnaires were administered both pre- and post-dissemination to assess changes in knowledge levels (Appendix 9). Follow-up questionnaires were administered 11-18 days post intervention (median 14, mode 14).

Sample size calculation

Sample size estimates were performed for a clustered design using a cluster sample size calculator (Campbell et al., 2004). An estimate of the variance at village level from previous studies in developing countries (Bell et al., 2005) was used, giving a design effect of 2.3 and an intra-cluster correlation coefficient of 0.14. A total of eight villages each with 15 owners (total 480 participants) per type of intervention were required to detect a 30% change in knowledge (e.g. an increase from a baseline of 20% to 50%) with 95% confidence and 80% power. Therefore 32 villages with at least 25 owners per village were selected to allow for potential non response and loss to follow up. A blocked design was used such that, within each set of eight randomly selected villages, each knowledge-transfer intervention and control was assigned randomly to two villages. This was to avoid runs of one type of intervention being selected by chance, as we hypothesized that season, and seasonal job activities of farmers, may affect the response rates.

Study sites and participants

The c-RCT was carried out between November 2008 and July 2009 in one of the seven regional zones of Ethiopia (Oromia). Within this region, one zone (Arsi) was selected based upon: a lack of previous exposure to an equine veterinary NGO, a known high density of donkey users and logistical considerations. Within this area four woredas (administrative departments) (Sire, Hitosa, Tiyo, Degeluna Tijo) were non-randomly selected and a complete list of villages within the woredas was obtained from each woreda agricultural office. Thirty two villages were randomly selected using random numbers generated in a spreadsheet programme (Microsoft Excel 2007, Microsoft Cooperation, USA). Villages were excluded if there was no road access; the Development Agent (DA) was deemed too inexperienced or new to that village (were unable to identify and contact randomly recruited participants); if there were inadequate villager records; or if selected villages shared a major market at which contamination may occur (Appendix 10). Development agents were recruited to liaise with each selected village and to aid in the participant recruitment process. Lists of village inhabitants were obtained from village agricultural offices or municipality offices, and participants in villages were randomly selected using random numbers generated in Microsoft Excel 2007 (Microsoft Cooperation, USA). Participants were eligible for inclusion in the c-RCT if they were male, owned or used a donkey, over 18 years of age, and able to attend the study visits. All participants were recruited on a volunteer basis and were free to refuse participation or leave the trial at any point (See Appendix 11 for participant project briefing). Formal consent was assumed by continued participation in the trial after an introduction to the trial was administered. Once recruited, participants were assigned a unique identification (ID) number and ID card, and were also paid a nominal monetary incentive for participation in each study visit (Appendix 12). The visit dates for both the pre-intervention visit and the follow up visit were pre-determined, and DA's were responsible for ensuring that participants were informed of the correct date and time.

Data collection and analysis

Baseline data were collected at the pre-intervention visit and included age, formal education level, radio use, literacy level (Afan Oromo and Amharic), number of donkeys owned, length of donkey use, other animals owned, housing of donkey, exposure to equine veterinary NGO's, position in household, and responsibility for decisions regarding donkey

management (use and treatment). Participants' knowledge-change was measured using twelve concise questions about donkey wounds and wound management. These questions corresponded to the 10 defined learning objectives, and were identical in both pre-intervention and follow-up questionnaires. The twelve questions required participants to volunteer between one and four correct responses per question, to achieve a total possible maximum score of twenty eight (Appendix 13). Questionnaires were extensively piloted and reverse translated. All questionnaires were administered on an individual basis by one trained animal health worker (AHW) in either of two regional languages (Afan Oromo and Amharic) in a consistent and controlled manner with no additional clarification. Questionnaires took approximately 20 minutes per participants to complete. To avoid contamination of participants who had not yet received a questionnaire by individuals who had already completed the questionnaire, all participants were kept in two separated groups. This occurred until the time that either a group intervention could be administered (in villages allocated as either audio or village meeting intervention), or participants who had completed the questionnaire could leave the village (in villages allocated as either control groups or handout interventions). The administrators of the questionnaires, and those assessing the outcomes of the trial were not blinded due to logistical constraints involved with this intervention trial.

Data were entered into a spreadsheet (Microsoft Excel 2007, Microsoft Cooperation, USA) and analysed using SPSS v17 (SPSS Inc, Chicago, Illinois, USA) and MLwiN v2.02 (Centre for Multilevel Modelling, Bristol, UK). Data analysis included comparison of baseline-data between intervention groups to check for adequate randomisation using Chi-squared tests for categorical data and Kruskal-Wallis or Mann-Whitney tests for continuous data. The primary outcome measure used was a continuous variable reflecting the change in score between pre- and post-intervention questionnaires. The change in score of individual respondents was compared between the different knowledge-transfer interventions using multilevel linear regression models to allow for clustering of individuals within villages. Analysis was carried out on a per-protocol basis due to no data being available on the outcome of those participants lost at follow up. However due to the small number of participants lost (n=12) this is unlikely to have had a biasing effect. The effect of all covariates that varied at baseline was also considered. Continuous variables (age and pre intervention score) were centred by subtraction of the sample mean from all observations and checked for linearity before entry into the final model by use of a generalised additive model (GAM) (Hastie and Tibshirani, 1990). A backward-stepwise process was used, with

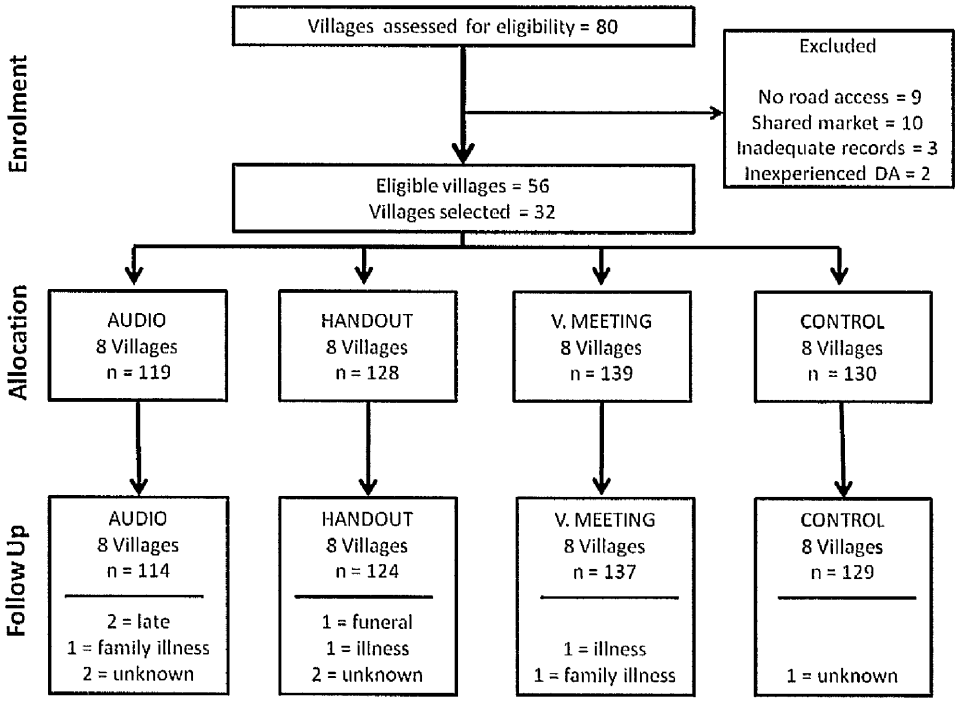
covariates remaining in the model if they were statistically significant (p = 0.05), or if they altered the effect of other covariates by greater than 25%. Random coefficients models, allowing the coefficients for fixed effects, including the intervention, to vary across villages (i.e. random slopes), were assessed to determine if the effects varied by villages (Appendix 14). The significance of interaction terms was tested between all fixed effect variables. Model diagnostics included detection of villages with a large influence on the fit of the model by examination of residuals and leverage values and evaluation of residuals in normal probability plots to check that the residuals at each level followed a normal distribution (Rasbash et al., 2008)

Results

Descriptive results

Eighty villages were assessed for eligibility and 24 were excluded due to lack of road access (n=9), the Development Agent (DA) was either too inexperienced or new to village (n=2), inadequate villager records (n=3) or due to the sharing of a major market (n=10). From the remaining 56 villages, 32 were randomly selected and interventions randomly assigned (Figure 1). A total of 516 participants from 32 villages undertook the pre-intervention questionnaire, 504 of these participants undertook the post-intervention questionnaire, a response rate of 98%. Reasons for seven of the 12 participants who were lost at follow up were obtained; these included personal and family illness, funeral attendance and late arrival at the follow up visit (Figure 1). There was no significant difference in the proportion of participants lost across intervention groups.

Figure 1: c-RCT flow diagram indicating number of participants and villages at each stage of the trial.



Baseline information on participants (Tables 2 and 3) revealed low formal levels of education, with the majority of participants having only attended formal schooling until primary level. The majority owned one donkey, with a large majority owning cattle and oxen as well. Baseline information revealed low levels of literacy, with a greater proportion of participants unable to read Afan Oromo than Amharic. The majority of the participants listened to the radio daily.

Table 2: Age and pre-intervention score, and comparison across intervention groups for 516 participants in a c –RCT in Oromia region, Ethiopia

			Intervention				
Variable		**Overall**	**Control**	**Audio**	**Handout**	**Village Meeting**	**Kruskal-Wallis P value**
Age	Mean	45.66	44.45	48.85	42.27	47.01	0.01
	Median	45.00	43.00	48.00	40.00	48.00	
	Percentiles (25)	33.00	33.00	36.00	32.00	32.00	
	Percentiles (75)	57.00	54.25	60.00	50.75	60.00	
Pre-intervention Score	Mean	6.28	6.40	6.69	5.95	6.10	0.08
	Median	6.00	6.75	7.00	6.00	6.00	
	Percentiles (25)	5.00	5.00	5.00	5.00	4.00	
	Percentiles (75)	8.00	8.00	8.00	7.00	8.00	

Baseline comparison of randomisation

Analysis of baseline data to check the randomisation process showed that a number of variables (age, number of donkeys owned and ownership of horses, sheep, goats and dogs) were significantly different between intervention groups (Tables 2 and 3), and pre-intervention scores approached significance. Further analysis revealed that the pre intervention scores of the audio group were significantly higher than those of both the handout and village meeting groups. Baseline comparison of age amongst the intervention groups revealed significant differences, with the audio group being older than the control and handout intervention groups. The village meeting intervention group was significantly older than the handout intervention group. The effects of these differences were explored in the multivariable analysis.

Table 3: Baseline information and comparison across intervention groups for categorical data for 516 participants in a c –RCT in Oromia region, Ethiopia.

			Intervention				
Variable		Overall	Control	Audio	Handout	Village Meeting	Chi square (P-value)
		(%)	n (%)	n (%)	n (%)	n (%)	
Education level	No Education	24.6	26 (20)	30 (25)	34 (27)	37 (27)	0.6
	Adult Education	14.5	14 (11)	21 (18)	19 (15)	21 (15)	
	Primary	33.3	49 (38)	33 (28)	40 (31)	50 (36)	
	Junior	13.8	19 (15)	18 (15)	15 (12)	19 (14)	
	Higher	13.6	22 (17)	17 (14)	19 (15)	12 (9)	
	Other (Advanced)	0.2	0 (0)	0 (0)	1 (1)	0 (0)	
Literacy (Afan Oromo)	No	78.5	101 (78)	99 (83)	102 (80)	103 (74)	0.4
	Yes	21.5	29 (22)	20 (17)	26 (20)	36 (26)	
Literacy (Amharic)	No	44.6	50 (39)	53 (45)	56 (44)	71 (51)	0.2
	Yes	55.4	80 (62)	66 (56)	72 (56)	68 (49)	
Listen to radio daily	No	20.0	25 (19.2)	23 (19.3)	19 (14.8)	36 (25.9)	0.2
	Yes	80.0	105 (80.8)	96 (80.7)	109 (85.2)	104 (74.1)	
Number of donkeys	0	6.0	6 (4.6)	8 (6.7)	7 (5.5)	10 (7.2)	0.04
	1	52.1	60 (46.2)	79 (66.4)	60 (46.9)	70 (50.4)	
	2	27.9	43 (33.1)	22 (18.5)	41 (32.0)	38 (27.3)	
	3	10.3	19 (14.6)	6 (5.0)	13 (10.2)	15 (10.8)	
	>3	3.7	2 (1.5)	4 (3.4)	7 (5.5)	6 (4.3)	
Own horse	No	71.1	71 (54.6)	76 (63.9)	109 (85.2)	111 (79.9)	<0.001
	Yes	28.9	59 (45.4)	43 (36.1)	19 (14.8)	28 (20.1)	
Own mule	No	97.5	124 (95.4)	116 (97.5)	128 (100)	135 (97.1)	0.1
	Yes	2.5	6 (4.6)	3 (2.5)	0 (0)	4 (2.9)	
Own cattle/ox	No	6.4	5 (3.8)	6 (5.0)	11 (8.6)	11 (7.9)	0.3
	Yes	93.6	125 (96.2)	113 (95.0)	117 (91.4)	128 (92.1)	
Own sheep	No	37.0	33 (25.4)	37 (31.1)	69 (53.9)	52 (37.4)	<0.001
	Yes	63.0	97 (74.6)	82 (68.9)	59 (46.1)	87 (62.2)	
Own goat	No	74.2	107 (83.3)	96 (80.7)	82 (64.1)	98 (70.5)	<0.001
	Yes	25.8	23 (17.7)	23 (19.3)	46 (35.9)	41 (29.5)	
Own dog	No	27.9	18 (13.8)	35 (29.4)	36 (28.1)	55 (39.6)	<0.001
	Yes	72.1	112 (86.2)	84 (70.6)	92 (71.9)	84 (60.4)	
Own Poultry	No	21.9	30 (23.1)	25 (21.0)	22 (17.2)	36 (25.9)	0.4
	Yes	78.1	100 (76.9)	94 (79.0)	106 (82.8)	103 (74.1)	

Multilevel linear regression analysis

Change in score was approximately normally distributed and ranged from -4.5 (i.e. some participants did worse at follow up) to 20. The initial model only considered the interventions (Model 1). All interventions significantly improved the overall change in score between pre- and post-intervention questionnaires compared to the control (Table 4), with the handout and village meeting having a significantly greater impact than the audio programme ($p<0.001$). There was no significant difference between the village meeting and handout ($p=0.4$). The final model (Model 2) considered all intervention types and those covariates which were significantly different at baseline comparison. Of these, the only covariates shown to have a significant effect on the outcome were age and pre-intervention score. These both had a linear relationship with the outcome. The higher the pre-intervention score and the older the age of participant, the less the changes in score at follow up. However, there was a significant interaction between age and the effect of the intervention (Figure 2) showing that the effect of age was more pronounced in the group that received that handout. The variance at the village level was small compared to variance at the individual participant level and accounted for only 4.2% of the total variation, suggesting that the majority of the variance can be attributed to differences between individuals rather than between villages. Random slope effects were not significant, suggesting that there were no differences in the effect of a single type of intervention across different villages. Normal probability plots of both the individual and village level residuals showed that the assumption of normality was reasonable (Appendix 15). Village level residual plots (Figure 3) showed that one village was significantly different from the overall mean. This village received a handout intervention. Plots of leverage and influence values also showed that this village had moderately high leverage and the highest influence value. Inclusion of this village as a dummy variable (Rasbash et al., 2008) to fit an intercept separately from those of the other villages did reduce the overall deviance and the parameter estimate for this village was significant (coefficient 3.5, s.e. 1.1) showing that the change in score was increased in this village. However, estimates for the overall effect of the interventions changed very little.

Table 4: Multilevel linear regression models showing the impact of different interventions on a change in score between questionnaires in 504 participants in a c –RCT in Oromia region, Ethiopia.

	Model 1		Model 2	
	Coefficient (S.E)	P-value	Coefficient (S.E)	P value
Intervention				
Control (intercept)	0.6		0.6	
Audio	4.8 (0.6)	<0.001	5.2 (0.6)	<0.001
Handout	9.5 (0.6)	<0.001	8.9 (0.6)	<0.001
Village meeting	9.7 (0.6)	<0.001	9.6 (0.5)	<0.001
Age (years) [a]			-0.02 (0.02)	0.2
Pre-intervention score [a]			-0.4 (0.03)	<0.001
Intervention*Age				
Control*Age			Ref.	
Audio*Age[a]			-0.04 (0.03)	0.135
Handout*Age[a]			-0.12 (0.03)	<0.001
Village Meeting*Age[a]			-0.03 (0.03)	0.3
Village variance	0.5 (0.3)		0.7 (0.3)	
Individual variance	10.7 (0.7)		8.8 (0.6)	

[a] Indicates variables were centred. Therefore the control coefficient (intercept) represents the change in score for controls of average age and with average pre-intervention score. Ref. = Reference category

Figure 2: Plot showing the effect of the significant interaction between age and interventions

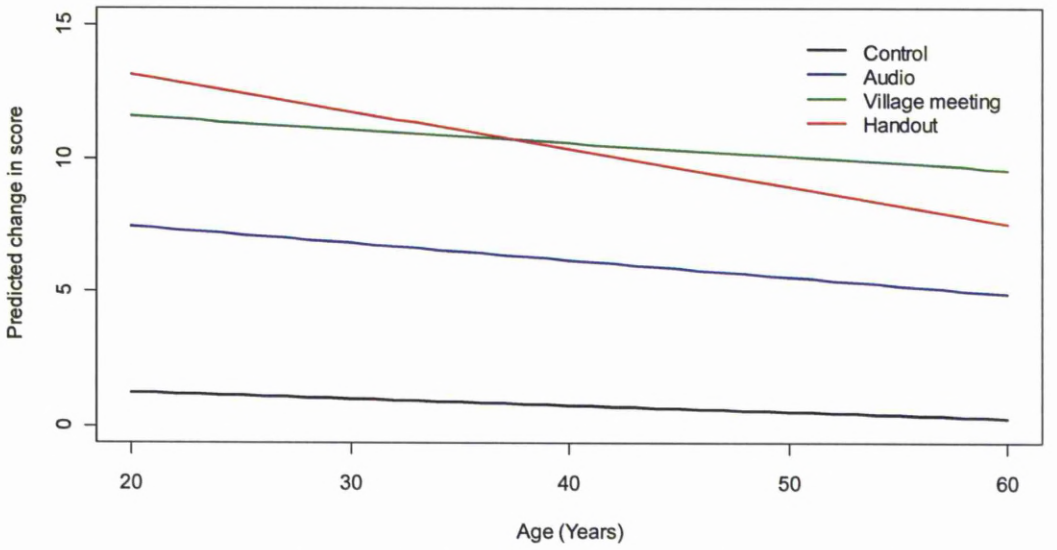
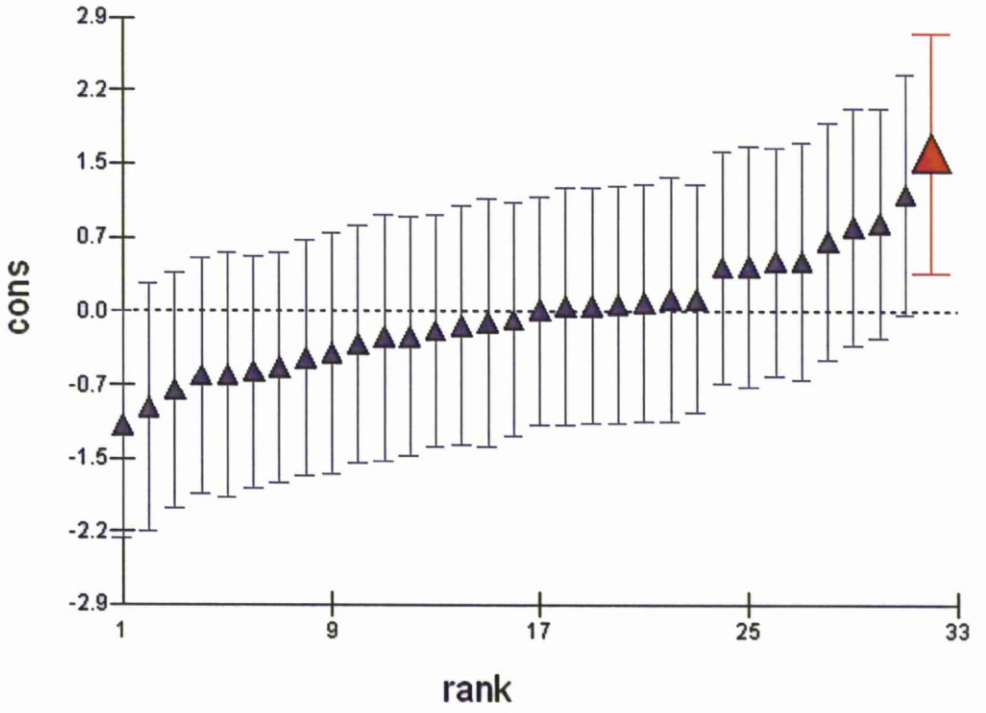


Figure 3. Plot of village level residuals (+/- 95% confidence intervals) of the 32 villages ordered by rank. The village with the highest residual is shown in bold as a village that received the handout intervention.



Discussion

To the authors' knowledge this is the first study to evaluate the effectiveness of different knowledge-transfer interventions for adult learning amongst working equid users in a developing country. All interventions improved post-intervention knowledge of the target audience, however, the handout and village meeting improved these scores nearly twice as much as the audio programme. The final model showed that the age of the participant and pre-intervention score (baseline knowledge) had an effect on the outcome variable (change in score). Further, the effect of age varied across interventions and was more pronounced in the participants that received the handout such that the handout performed best among young participants, whilst in the older participants the village meeting performed best. This is consistent with previous work, suggesting that older age groups have lower literacy proficiency than younger adults (Desjardins, 2003), most likely as a result of younger populations having received more extended formal schooling than older populations, with the added benefit of having received that schooling more recently. This lower literacy proficiency could lead to a reduced ability for knowledge acquisition from materials requiring literacy and/or visual literacy such as the handout used in this study.

There are few comparable studies in the literature which utilise randomised controlled trials to show the efficacy of different knowledge-transfer interventions, however, our results are supported by evidence of an increase in knowledge with a variety of interventions amongst Tanzanian smallholder dairy farmers (Bell et al., 2005) and of farmer's knowledge of trypanosomiasis (diagnosis and treatment) two weeks post-dissemination of an information pamphlet (Grace et al., 2008).

After allowing for the effect of intervention, age and pre-intervention score there was little remaining variation between villages. However, one village was significantly different from the overall mean and this also had a high influence value. Removal of this village had little impact on the estimates of the effects of the interventions (or of age or pre-intervention score). A potential explanation as to why this village had the largest increase in change in score on the questionnaire could be that many participants from this village brought their handouts to the follow up visit (identified from contemporaneous field notes; data not presented), and were therefore able to refer to them prior to (although not during) the questionnaire. It is an advantage of this form of intervention that the content is still available after the initial visit and therefore available to be discussed between villagers at will. However, we did not collect data at this stage to confirm this and the authors are

unaware of any specific reasons why this village would be different to other villages in the trial.

The use of defined learning objectives to guide the design and development of all three interventions was essential to ensure that the core content of each was consistent, and that their effect on knowledge-change could then be objectively evaluated (Ramhani, 2006). Learning objectives can provide an explicit overview of both what 'the learner should have achieved' and 'what should be assessed' at the end of an educational programme, and it is recommended that they are formulated at the start of an educational programme to aid robust curriculum design and delivery (Harden, 2002).

Both the formal education levels and literacy levels of the target audience were expected to be low, and this was considered during the design and development phase of the interventions prior to commencement of the c-RCT. Research carried out during both the PSA and the piloting of interventions identified low levels of literacy ability amongst the target audience in both main regional languages (Afan Oromo or Amharic), suggesting that a more diagrammatic/pictorial intervention was required. The participants in our study revealed low levels of literacy, with a greater percentage of participants unable to read Afan Oromo than Amharic. Despite this, our interventions were designed in Afan Oromo as this is the official language of the region, the language currently being taught at school and the language that the majority of our target audience communicate in (even if illiterate in this language).

There were also concerns over the visual literacy ability of our target audience. Visual literacy relates to the ability of an individual to accurately understand and interpret an image presented to them (Linney, 1995). Images should depict local situations from the daily lives of the intended audience (Harford and Baird, 1997) and should be piloted to ensure that the most suitable image type is utilised (e.g. black and white, colour, background removed, cartoon style). The use of visual images is not the panacea for all low literacy situations as visual illiteracy may be as common as actual illiteracy in some cases (Harford and Baird, 1997; Linney, 1995). Of all of the visual images tested during piloting of interventions, owners were best able to recognise "real-life" photos with the backgrounds removed and whitened out. The success of the handout in this study suggests that the considerable efforts made during the piloting and development phase of the study resulted in the production of a handout that was understandable and appropriate to the visual

literacy of the study participants however this did appear to vary with age of the participant. When designing extension materials as knowledge-transfer interventions, consideration must be given to the requirements of the intended target audience. It is important to understand the literacy, visual literacy and formal education levels of the intended target demographic (Bell et al., 2005). Other factors that may need to be considered are age, gender, relevance of content and previous exposure to knowledge-transfer programmes. All of these factors may impact on the decision making process for the design and development of suitable interventions for maximising knowledge change.

In this study, the village meeting and the handout provided the largest change in knowledge of the three study interventions. The combination of an oral presentation with demonstrations and visual images was likely to have accommodated all levels of literacy, visual literacy and language issues. The opportunity for a question and answer session within this format allowed participants to clarify any areas of confusion or any missed messages in either language. The handout was more successful in younger participants than older participants despite being designed to be predominately image-based with as little text as necessary. Older participants may have had lower levels of literacy and visual literacy proficiency, as well as less recent schooling, leading to less knowledge acquisition.

The audio programme was designed to simulate a possible future radio broadcast. Previous studies have shown high radio ownership amongst households within Ethiopia with regular radio listeners (Farr et al., 2005), and this was consistent with our findings which showed that 80% of participants listened to a radio on a daily basis. Formats using a drama performed by local actors were shown to be most popular amongst farmers listening to agricultural extension programmes (Chapman et al., 2003), and the effect of this format was shown to be greatest among uneducated (no formal education) individuals (Valente et al., 1994). Although the audio programme in this study had the least impact on change in knowledge when compared to the two other interventions it still significantly improved knowledge. The potential benefits of a successful audio intervention may be the ability to 'reach' thousands of listeners with relative ease of administration and low cost, which may outweigh or complement the greater knowledge impacts of the more labour intensive interventions. The strength of rural radio as an extension tool lies in its ability to reach an illiterate audience in a language they understand. Programme format should not simply involve dissemination of technical information, but should understand that the way the target audience discuss problems in their own communities, and provide relevant

information in suitable context (Chapman et al., 2003). In this study, despite some participants being unable to volunteer answers to some questions in the post-intervention questionnaire, many owners were able to remember the format and the names of the characters in the audio programme. One owner commented that for this intervention to be 'successful' for old men the audio programme should be repeated a number of times.

Only males were selected for inclusion in our study based on pilot work that showed that because of an existing male dominant hierarchy within Ethiopian households, males make the majority of decisions regarding use and healthcare of owned donkeys, and make the majority of decisions regarding household finances. During the piloting and design stage of the study, females were included in both individual and focus group discussions; however, they voiced concern that any new ideas concerning donkeys received from an education programme may not be accepted by the male head of the household (usually their husband). Despite the limitation of only including males in this study, it has been shown that education of the household head (predominately male) is found to decrease risk aversion in the adoption of new innovations in agriculture, thereby increasing the likelihood that a change in behaviour may result after a new and novel education intervention (Knight et al., 2003).

All data in this study were gathered via questionnaire interviews with participants in either of two regional languages (Afan Oromo or Amharic). Although the questionnaires utilised concise questions, many requiring only single word answers, the accuracy of all the data must be considered carefully, especially as the information required by the authors was translated. Reliability of participant information was not validated and may be imperfect or biased by participant reporting of perceived correct answers. However due to the study design (c-RCT), we would expect this bias or measurement error to be randomised across all participants, in all intervention groups, and therefore to have minimal effect on the estimates of the effects of interventions. Randomisation is designed to equally distribute potentially confounding factors across intervention groups; whether or not to present adjusted or unadjusted results is a subject of active debate (Dohoo et al,. 2003). The authors are unaware of any reason why the randomisation process in this study was not completely successful, and whether increasing the number of villages would have achieved complete randomisation. Results presented in this study have been adjusted for potential confounders and are presented in Model 2 which shows that they had a minimal effect on the interventions. Use of a control group allowed us to monitor participants for the

'Hawthorne Effect' (that a participant in the control group receiving a pre-intervention questionnaire would subsequently have a greater level of knowledge at the follow up visit) (Campbell et al., 1995). Little evidence of the 'Hawthorne Effect' was seen in this study as the average improvement in the control group was only 0.6 marks.

The three distinctly different knowledge-transfer interventions were utilised in this trial with varying levels of success. This highlights the need for tailor-made interventions specifically designed for the intended target audience to maximise knowledge change. It is worth noting that this study only intended to measure a change in knowledge of the participants. No attempt was made to measure whether this change in knowledge subsequently led to a change in behaviour. There are many reasons that interventions may fail to lead to a change in knowledge (such as poorly designed interventions, or literacy issues) as described earlier, however knowledge-transfer interventions may also fail to result in behavioural change for a number of reasons: limited access to the knowledge, the information (as presented) may be at odds with currently held beliefs; the presented material may be poorly understood; there may be financial constraints to implementation; there may be containment of ideas within groups, or inappropriate presentation of the information and therefore poor understanding. Consequently, effective animal health knowledge may remain unused by owners. The knowledge transfer programme carried out in this study may be considered as an initial step towards behaviour change; with other components such as skills development, attitudes development and motivational support also being required (Mitchell et al., 2001). Further work to evaluate longer term knowledge retention and owner-reported behaviour change is now underway.

Conclusion

In future, knowledge-transfer interventions developed for rural equid users in this region of Ethiopia should consider the formal education level, literacy/visual literacy ability and age of audience as key issues, and should be thoroughly piloted and refined before final release. This study showed that direct contact with a specifically trained animal health worker, in combination with a mixture of demonstration, presentation and question and answer session was an most effective knowledge transfer method. However, interventions based on visual images, designed and piloted with the intended audience were also shown to be successful, particularly in younger age participants. Ethiopia, with its large population of working equids, is ideally placed to benefit from appropriate education or extension

programmes for the owners and users of equids. The results from this study may be beneficial to other populations of livestock owners, particularly in sub-Saharan Africa, however, it is likely that different issues associated with learning across different communities may exist, and these must be carefully considered when designing education programmes.

CHAPTER FIVE:

Long-term follow-up evaluation of the efficacy of knowledge-transfer interventions on animal health knowledge of rural villagers in central Ethiopia

Abstract

There is currently limited peer-reviewed literature that evaluates the efficacy of knowledge-transfer interventions on adult learning using randomised controlled trials in low income countries, and to the authors' knowledge few peer-reviewed studies that evaluate the effect of education on working equid users. The objectives of this study were to evaluate the efficacy of several knowledge-transfer interventions, utilising a cluster-randomised controlled trial, on the long-term knowledge change (approximately six months post intervention) of rural Ethiopian villagers (working equid users). We also aimed to explore whether learning was different across different questions topics and learning objectives.

Interventions that groups were exposed to included: an audio programme, a village meeting and a diagrammatic handout. All interventions were compared to both a control group which received no intervention, and other intervention groups. All interventions addressed identical learning objectives. Thirty-two villages were randomly selected and interventions randomly assigned. All participants in a village received the same intervention and knowledge levels were assessed by questionnaire administration. Data analysis included multilevel linear and logistic regression models (allowing for clustering of individuals within villages) to evaluate the change in knowledge between the different knowledge-transfer interventions, and to look at other factors associated with change in knowledge. Data analysis also involved an evaluation of participants' opinions and intended behaviour towards interventions using thematic coding to extract important themes from qualitative data.

A total of 516 randomly selected participants completed pre-intervention questionnaires, 476 undertook a post-dissemination questionnaire approximately six months later, a follow-up response rate of 92%. All interventions significantly improved the overall 'change in knowledge' score on the questionnaire compared to the control group, with the diagrammatic handout (coefficient (coef) 10.0, S.E. = 0.5) and the village meeting (coef 8.5, S.E = 0.5) having a significantly greater impact than the audio programme (coef 4.0, S.E = 0.5). Multilevel logistic regression identified a difference in learning across interventions, learning objectives, age and education levels of the participants. Significant interactions meant that the effect of interventions were different across different learning objectives

and formal education levels. Participants with higher levels of formal education had greater knowledge change but this varied across intervention.

This study should assist in the design and development of effective knowledge-transfer materials for adult learning for rural villagers in low income countries.

Introduction

The numbers of working equids are increasing in many low-income countries, and their importance is being emphasised in response to increasing human populations, global economic issues and changing environments (Pritchard, 2010). There are estimated to be 2.0 million horses, 0.37 million mules and 5.7 million donkeys working in Ethiopia (Anon, 2012). The health, welfare and productivity of working horses, mules and donkeys in Ethiopia are affected by prevalent parasitic and infectious diseases, and problems associated with inadequate management practices (Curran et al., 2005, Pritchard et al., 2005, SPANA 2005; Yilma et al., 1990).

There are a variety of approaches to address the health and welfare concern of wounds in working donkeys, one approach is through the education of owners and communities. Chapter 4 described the short-term knowledge change (approximately two weeks after intervention) seen after utilising a cluster-randomised controlled trial to assess the efficacy of three knowledge-transfer interventions on equid owners. It is important to understand whether knowledge on a specific subject fades over time, as Grace et al., (2008) states that learning decays unless reinforced. Few randomised controlled trials have evaluated longer term knowledge change of animal owners. Grace et al., (2008) evaluated the knowledge of cattle owners in Mali approximately five months after an educational intervention and demonstrated that their knowledge on a specific subject (cattle trypanosomosis) was reduced at five months when compared to the two week post intervention assessment. To reduce this knowledge fade at longer time intervals post intervention, it is recommended that information for owners be made readily and continually available to farmers (Grace et al., 2008).

Thematic analysis of qualitative data allows researchers to extract valuable information from discussion transcripts and conversations (Fereday and Muir-Cochrane, 2006). Thematic analysis involves searching for themes (a form of pattern recognition) within data

allowing important emerging themes to become categories for analysis (Fereday and Muir-Cochrane, 2006).

The objectives of this study were to assess the efficacy of the interventions described in the c-RCT in Chapter 4 on the long-term (approximately six months) knowledge change of participants (to assess whether there was any knowledge fade compared to the short-term evaluation), and to assess if learning was different across different types of questions and learning objectives. A final objective was to assess qualitatively the participants' views and perceptions of the different interventions utilised.

Materials and Methods

The content of the knowledge-transfer interventions and the design of the c-RCT are described in detail in Chapter 4 (and Stringer et al., 2011). In brief, ten learning objectives (Table 1) were developed to address key issues associated with wounds and wound management in donkeys, including their causes, sites, treatment, prevention and relevance.

Table 1: Learning objectives (and the questionnaire number and question topic they correspond with) used to develop knowledge-transfer interventions on the topic of wounds and wound management in donkeys in Ethiopia.

	Learning Objectives	Questionnaire Number	Question Topic
1	Be able to list four causes of manmade wounds.	2	C/S
2	Identify four common sites/areas affected by manmade wounds.	1	C/S
3	Be aware of good and bad topical treatments for wounds.	5, 6	T
4	Describe how to prepare an appropriate salt solution for cleaning wounds.	7	T
5	Be able to list three steps involved in cleaning wounds appropriately.	4, 8	T
6	Recognise two signs of an early harness wound.	3	C/S
7	Select appropriate material as a base layer for the harness.	9	P
8	Describe three important features of the padding on the harness.	10	P
9	Describe an important feature of harness base layer care.	11	P
10	Recognise three disadvantages of your donkey having wounds.	12	R

C = Causes/Sites, T = Treatment, P = Prevention, R = Relevance.

These 10 learning objectives were then incorporated into the design and development of three different knowledge-transfer interventions; an audio programme (A), a village meeting facilitated by an animal health worker (VM) and a diagrammatic handout (HO). The interventions chosen for inclusion in the c-RCT were informed by results of other relevant published studies, the participatory situation analysis undertaken at the beginning of this study, and future sustainability, economics and logistical considerations. A c-RCT was used to compare the effects of the three knowledge-transfer interventions with a control group (that received no knowledge-transfer intervention) on change in knowledge of working equid users. Thirty two villages (kebeles) and 516 rural equid users were randomly selected and the same intervention was randomly assigned to all participants within each village, hence eight villages received each intervention (including control villages). Identical questionnaires were administered to all participants both pre- and post-dissemination to assess changes in knowledge levels (Appendix 16). Long term follow up questionnaires were administered 138-196 days post intervention (median 141, mode 141).

Data collection

Baseline data were collected at the pre-intervention visit and included age, formal education level, radio access, literacy level (in Afan Oromo and Amharic languages), number of donkeys owned, length of donkey ownership, other animals owned, housing of donkey, exposure to equine veterinary NGOs, position in household, and responsibility for decisions regarding donkey management (use and treatment). Participants' knowledge-change was measured using 12 concise questions about donkey wounds and wound management. These questions corresponded to the ten defined learning objectives (Table 1), and were identical in both pre-intervention and follow-up questionnaire. The participants were scored using two methods, producing a continuous outcome and a binary outcome (Appendix 13). The 12 questions required participants to volunteer between one and four correct responses per question. For example, one question asked participants: 'What are the causes of manmade wounds of donkeys'. For this question there were four possible causes, a mark was gained for each of the four correct causes (a maximum of four marks for this question). Participants could therefore score between zero and four on this question. Each question was also scored with a binary outcome, one or zero depending on whether the participant correctly answered all the individual parts or not, respectively. For example the participant would have had to correctly volunteer all four causes of manmade wounds to get a score of one (question correct). The continuous outcome was out of 28 (the maximum score for all the individual parts of each question), the binary outcome was out of 12 (for answering each individual question completely correct or incorrectly). Therefore to completely achieve a learning objective the participant must answer correctly all the individual parts of the question(s) associated with that learning objective.

At the follow-up visit, participants who had received a knowledge-transfer intervention (audio, diagrammatic handout or village meeting) were also asked 10 further evaluation questions concerning the knowledge-transfer programme (Appendix 16).

Data analysis – Multilevel linear regression analysis

Data were entered into a spreadsheet (Microsoft Excel 2007, Microsoft Cooperation, USA) and analysed using SPSS v19 (SPSS Inc, Chicago, Illinois, USA) and MLwiN v2.25 (Centre for Multilevel Modelling, Bristol, UK). Data analysis included comparison of baseline data between intervention groups to check for adequate randomisation using Chi-squared tests for categorical data and Kruskal-Wallis or Mann-Whitney tests for continuous data (Chapter

4 and Stringer et al., 2011). The outcome measure used was a continuous variable reflecting the change in score between pre- and post-intervention questionnaires (out of a maximum of 28). The change in score of individual respondents was compared between the different knowledge-transfer interventions using multilevel linear regression models to allow for clustering of individuals within villages. Analysis was carried out on a per-protocol basis due to no data being available on the outcome of those participants lost at follow up. However, due to the small number of participants lost (n=40) this is unlikely to have had a major biasing effect. The effect of all covariates that varied at baseline was also considered.

All variables that showed some association with the outcome on univariable analysis (p-value <0.25) were considered during the building of the final multivariable models (Appendix 17). Continuous variables (age and pre-intervention score) were centred by subtraction of the sample mean from all observations and checked for linearity before entry into the final model by use of a generalised additive model (GAM) (Hastie and Tibshirani, 1990). A backward-stepwise process was used, with covariates remaining in the model if they were statistically significant (p-value <0.05), or if they altered the effect of other covariates by greater than 25%. Random slopes, interactions terms and model diagnostics (including evaluation of residual plots) were all assessed as previously described in Chapter 4 and Stringer et al., (2011).

Data analysis – Multilevel logistic regression analysis

The outcome measure used was a binary variable reflecting whether knowledge improved for each of the 12 individual questions. Hence, where participants answered incorrectly at the pre-intervention questionnaire and correctly at the post-intervention questionnaire they were deemed to have improved knowledge and were coded as one. All other combinations were coded zero (Tables 3 and 4). For the majority of questions, few participants got the answer correct first time, so the number of participants going from correct to incorrect, or correct to correct was low (Table 3). Associations between the dependent variable (knowledge improvement of individual participants) and the independent variables including the intervention type, the question topic (causes and signs, treatment, prevention, relevance) the learning objective, education levels, age and other demographic variables were compared using three-level logistic regression models to allow for clustering of questions within individuals, and individuals within villages. Where variables were highly correlated, a decision was made to include only one of each of the

variables into each separate model, or to include the most biologically meaningful variable. All variables that showed some association with the outcome on univariable analysis (p-value <0.25) were considered during the building of the final multivariable models (Appendix 18). A backward-stepwise process was used, with covariates remaining in the model if they were statistically significant (p-value <0.05), or if they altered the effect of other covariates by greater than 25%. Models were fit using penalised quasi-likelihood with 2nd order Taylor series expansion. The significance of interaction terms was tested between all fixed effect variables. In order to fit models, it was necessary to remove certain variables due to small sample sizes. For example, for certain learning objectives (learning objectives one, six, eight and ten) only a small number of participants had improved their knowledge at long term follow up and this made it problematic to fit interaction terms. As a result, only learning objectives where greater than 10% of participants had improved their knowledge were included in the final model. Plots of predicted probabilities (predicted probability of getting a specific question correct after an intervention) were used to demonstrate significant interaction effects between independent variables in the final model, highlighting the effect of different interventions across different learning objectives and across different education levels

Data analysis – Qualitative data analysis

Data were entered and analysed in a spreadsheet (Microsoft Excel 2007, Microsoft Cooperation, USA). Evaluation questions were designed so that they could be answered in short one sentence answers. These were then thematically coded to enable the extraction of important themes from within participants' responses.

Results

Descriptive results (long term follow-up)

A total of 516 participants from 32 villages undertook the pre-intervention questionnaire (Audio = 119, Handout = 128, Village Meeting = 139 and Control = 130). There was a loss of 40 participants at the long term follow-up phase, thus 476 participants undertook the post-intervention questionnaire (Audio = 109, Handout = 114, Village Meeting = 128 and Control = 125), an overall response rate of 92%. There was no significant difference in the proportion of participants lost across intervention groups. Baseline information on

participants (Chapter 4 and Stringer et al., 2011) revealed low formal levels of education, with the majority of participants having only attended formal schooling until primary level. There were low levels of literacy, with a greater proportion of participants unable to read Afan Oromo (78.5%) than Amharic (21.5%). The majority of the participants had access to a radio (80.0%).

Baseline comparison of randomisation

Analysis of baseline data to check the randomisation process showed that a number of variables (age, number of donkeys owned and ownership of horses, sheep, goats and dogs) were significantly different between intervention groups (Chapter 4 and Stringer et al., 2011), and pre-intervention scores approached significance.

Multilevel linear regression analysis

Change in score was approximately normally distributed and ranged from -5 (i.e. some participants did worse at follow up) to 19. The final model (Model 2) considered all intervention types and those covariates which had a significant effect on the outcome (age and pre-intervention score). Results were generally similar to findings at short term follow-up (Chapter 4 and Stringer et al., 2011), with one key new findings. All interventions significantly improved the overall change in score between pre- and post-intervention questionnaires compared to the control (Table 2), with the handout and village meeting having a significantly greater impact on knowledge change than the audio programme ($p<0.001$). However at the long-term follow-up, there was also a significantly greater increase in knowledge with the handout compared to the village meeting ($p=0.02$). Other covariates shown to have an effect on the outcome variable were age and pre-intervention score.

Similar to short-term findings, the long-term follow-up showed that there was a significant interaction between age and the effect of the intervention on knowledge change (Figure 1), showing that the effect of age was more pronounced in the group that received that handout. The variance at the village level was small compared to variance at the individual participant level and accounted for only 4.3% of the total variation. Random slope effects were not significant, suggesting that there were no differences in the effect of a single type of intervention across different villages. Normal probability plots of both the individual and village level residuals showed that the assumption of normality was reasonable (Appendix

19). Village level residual plots showed that one village was significantly different from the overall mean. This village received a handout intervention. Plots of leverage and influence values also showed that this village had moderately high leverage and the highest influence value. Inclusion of this village as a dummy variable (Rasbash et al., 2008) to fit an intercept separately from those of the other villages did reduce the overall deviance and the parameter estimate for this village was significant (coefficient -2.7, S.E 0.9) showing that the change in score was decreased in this village. However, estimates for the overall effect of the interventions changed very little.

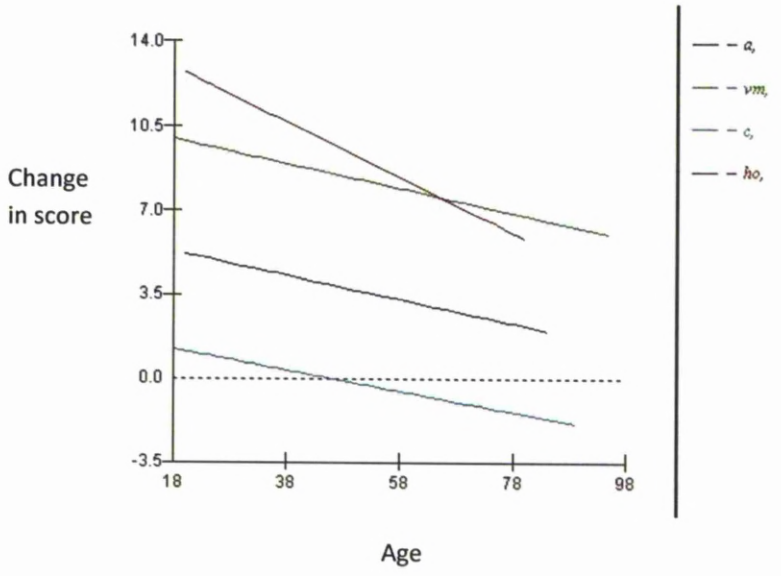
Table 2: Multilevel linear regression models showing the impact of different interventions on a change in knowledge score between questionnaires in 476 participants in a c –RCT in Oromia region, Ethiopia at long-term follow-up (138-196 days post intervention).

	Model 1		Model 2	
	Coefficient (S.E)	P-value	Coefficient (S.E)	P value
Intervention				
Control (intercept)	0.8		0.8	
Audio	4.0 (0.5)	<0.001	4.0 (0.5)	<0.001
Handout	10.0 (0.5)	<0.001	10.0 (0.5)	<0.001
Village meeting	8.6 (0.5)	<0.001	8.5 (0.5)	<0.001
Age (years) [a]			-0.04 (0.02)	<0.001
Pre-intervention score [a]			-0.5 (0.06)	<0.001
Intervention*Age				
Control*Age			Ref.	
Audio*Age[a]			-0.006 (0.03)	0.8
Handout*Age[a]			-0.07(0.03)	0.008
Village Meeting*Age[a]			-0.008 (0.03)	0.8
Village variance	0.4 (0.2)		0.4 (0.3)	
Individual variance	9.0 (0.6)		8.7 (0.6)	

[a] Indicates variables were centred. Therefore the control coefficient (intercept) represents the change in score for controls of average age and with average pre-intervention score. Ref. = Reference category

Model 1: This model only considers the interventions. Model 2: This model considers the interventions and those covariates shown to have a significant effect on the outcome.

Figure 1: Plot showing the effect of the significant interaction between age and interventions in the multilevel linear regression model (Model 2).



Multilevel logistic regression analysis

Greater than 10% of participants showed an improvement in knowledge on eight of the 12 questions at long-term follow-up, with the other four questions having less than 10% of participants improving (Table 3). Six of the ten learning objectives had greater than 10% of participants improving, and are highlighted in Table 4. There were variations across each question and each learning objective in the percentage of participants that improved depending on which intervention they received (Tables 3 and 4). The largest overall improvement was seen in learning objective 3 (Be aware of good and bad treatments for wounds). This learning objective corresponded to two questions in the questionnaire (questions 5 and 6). Overall, 51.3% of participants improved their knowledge on this learning objective, with 80.7%, 76.6% and 40.8% of participants who received a handout, a village meeting or audio programme improving respectively. Two of the learning objectives (learning objectives 4 and 7) revealed much larger improvements in knowledge in participants who received a handout, compared to participants who received an audio programme. The learning objective which had the smallest overall improvement (learning objective 6) of 1.1%, showed no improvement in the audio participants.

The explanatory variables selected by univariable analysis ($p<0.25$) for consideration in the multilevel models were: intervention, age, radio access, Afan Oromo and Amharic literacy, formal education level, cattle/ox, sheep, mule, and dog ownership, whether an owner gave advice on donkey care, question number, question type and learning objective.

The final multivariable model showed that all interventions significantly improved the participants' ability to answer a question correctly at long-term follow-up, with the handout performing most effectively, followed by the village meeting and then the audio programme, when compared to the control (Table 5). Other significant variables in the final model included learning objective, education level and age. As per previous results, as age increased participants were less likely to have an improvement in knowledge. There were also two significant interaction effects between learning objective and intervention and between education level and intervention. Thus, the effect of the interventions was different across different learning objectives and across different education levels (Table 5). Plots of predicted probabilities (predicted probability of getting a specific question correct after an intervention) demonstrate this (Figures 2a-2f). For example, with regards to learning objective 5 (Be able to list 3 steps involved in cleaning wounds appropriately), and learning objective 9 (Describe an important feature of harness base layer care) there is clearly an effect of education level in the handout intervention but little or no effect of education in the audio or village meeting groups (Figure 2d). In learning objective 2 and 3, both village meeting and handout are similarly effective, with only slight effects of increasing effectiveness in participants with higher education levels (Figure 2a and 2b). With learning objective 4, the handout intervention is more effective than the village meeting, with a significantly greater effect at higher educational levels (Figure 2c). In learning objective 7 the handout is the only intervention that has any significant effect, again with a significantly greater effect at higher educational levels (Figure 2e).

The variance at the village level (0.014) was small compared to variance at the individual participant level (0.471) and accounted for only 2.9% of the total variation, suggesting that the majority of the variance can be attributed to differences between individuals rather than between villages. Random slope effects were tested where possible and were not significant, suggesting that there were no differences in the effect of a single type of intervention across different villages.

Table 3: Descriptive statistics of binary responses to individual questions at pre and (138-196 days) post intervention across different interventions.

Responses at long term		Incorrect at pre and post-intervention n (%)	Correct at pre and post-intervention n (%)	Correct at pre-intervention and incorrect at post-intervention n (%)	Incorrect at pre-intervention and correct at post-intervention n (%)
Question 1	C	114 (91.2)	2 (1.6)	2 (1.6)	7 (5.6)
	A	64 (58.7)	3 (2.8)	0 (0.0)	42 (38.5)
	VM	26 (20.3)	3 (2.3)	0 (0.0)	99 (77.3)
	HO	20 (17.5)	4 (3.5)	0 (0.0)	90 (78.9)
	All	224 (47.1)	12 (2.5)	2 (0.4)	238 (50.0)
Question 2	C	124 (99.2)	1 (0.8)	0 (0.0)	0 (0.0)
	A	106 (97.2)	0 (0.0)	0 (0.0)	3 (2.8)
	VM	111 (86.7)	0 (0.0)	1 (0.8)	16 (12.5)
	HO	96 (84.2)	0 (0.0)	0 (0.0)	18 (15.8)
	All	437 (91.8)	1 (0.2)	1 (0.2)	37 (7.8)
Question 3	C	125 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
	A	109 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
	VM	127 (99.2)	0 (0.0)	0 (0.0)	1 (0.8)
	HO	110 (96.5)	0 (0.0)	0 (0.0)	4 (3.5)
	All	471 (98.9)	0 (0.0)	0 (0.0)	5 (1.1)
Question 4	C	122 (97.6)	0 (0.0)	1 (0.8)	2 (1.6)
	A	87 (79.8)	2 (1.8)	0 (0.0)	20 (18.3)
	VM	60 (46.9)	0 (0.0)	0 (0.0)	68 (53.1)
	HO	60 (52.6)	2 (1.8)	0 (0.0)	52 (45.6)
	All	329 (69.1)	4 (0.8)	1 (0.2)	142 (29.8)
Question 5	C	104 (83.2)	1 (0.8)	1 (0.8)	19 (15.2)
	A	22 (20.2)	6 (5.5)	0 (0.0)	81 (74.3)
	VM	11 (8.6)	0 (0.0)	0 (0.0)	117 (91.4)
	HO	14 (12.3)	3 (2.6)	0 (0.0)	97 (85.1)
	All	151 (31.7)	10 (2.1)	1 (0.2)	314 (66.0)
Question 6	C	124 (99.2)	0 (0.0)	1 (0.8)	0 (0.0)
	A	100 (91.7)	0 (0.0)	1 (0.9)	8 (7.3)
	VM	49 (38.3)	0 (0.0)	0 (0.0)	79 (61.7)
	HO	26 (22.8)	1 (0.9)	0 (0.0)	87 (76.3)
	All	299 (62.8)	1 (0.2)	2 (0.4)	174 (36.6)

Key: C = Control, A = Audio, VM = Village Meeting, HO = Handout, All = All interventions

Table 3 (continued): Descriptive statistics of binary responses to individual questions at pre and (138-196 days) post intervention across different interventions.

Responses at long term		Incorrect at pre and post-intervention n (%)	Correct at pre and post-intervention n (%)	Correct at pre-intervention and incorrect at post-intervention n (%)	Incorrect at pre-intervention and correct at post-intervention n (%)
Question 7	C	123 (98.4)	0 (0.0)	2 (1.6)	0 (0.0)
	A	100 (91.7)	1 (0.9)	0 (0.0)	8 (7.3)
	VM	76 (59.4)	1 (0.8)	0 (0.0)	51 (39.8)
	HO	44 (38.6)	0 (0.0)	1 (0.9)	69 (60.5)
	All	343 (72.1)	2 (0.4)	3 (0.6)	128 (26.9)
Question 8	C	88 (70.4)	10 (8.0)	19 (15.2)	8 (6.2)
	A	59 (54.1)	8 (7.3)	20 (18.3)	22 (20.2)
	VM	60 (46.9)	11 (8.6)	20 (15.6)	37 (28.9)
	HO	52 (45.6)	7 (6.1)	10 (8.8)	45 (39.5)
	All	259 (54.4)	36 (7.6)	69 (14.5)	112 (23.5)
Question 9	C	125 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
	A	101 (92.7)	0 (0.0)	8 (7.3)	0 (0.0)
	VM	117 (91.4)	0 (0.0)	0 (0.0)	11 (8.6)
	HO	59 (51.8)	0 (0.0)	0 (0.0)	55 (48.2)
	All	402 (84.5)	0 (0.0)	8 (1.7)	66(13.9)
Question 10	C	125 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
	A	106 (97.2)	0 (0.0)	2 (1.8)	1 (0.9)
	VM	115 (89.8)	1 (0.8)	1 (0.8)	11 (8.6)
	HO	106 (93.0)	0 (0.0)	2 (1.8)	6 (5.3)
	All	452 (95.0)	1 (0.2)	5 (1.1)	18 (3.8)
Question 11	C	85 (68.0)	13 (10.4)	14 (11.2)	13 (10.4)
	A	48 (44.0)	28 (25.7)	14 (12.8)	19 (17.4)
	VM	43 (33.6)	31 (24.2)	11 (8.6)	43 (33.6)
	HO	36 (31.6)	23 (20.2)	5 (4.4)	50 (43.9)
	All	212 (44.5)	95 (20.0)	44 (9.2)	125 (26.3)
Question 12	C	125 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
	A	108 (99.1)	0 (0.0)	1 (0.9)	0 (0.0)
	VM	125 (97.7(	0 (0.0)	0 (0.0)	2 (2.3)
	HO	103 (90.4)	0 (0.0)	0 (0.0)	11 (9.6)
	All	461 (96.8)	0 (0.0)	1 (0.2)	14 (2.9)

Key: C = Control, A = Audio, VM = Village Meeting, HO = Handout, All = All interventions

Table 4: Percentage of participants (n=476) who improved on specific learning objectives across interventions groups between pre-intervention and long-term follow-up.

Learning objectives		Improved Control (%)	Improved Audio (%)	Improved Village Meeting (%)	Improved Handout (%)	Improved All (%)
1	**Be able to list four causes of manmade wounds.**	0.0	2.8	12.5	15.8	7.8
2 *	**Identify four common sites/areas affected by manmade wounds.**	5.6	38.5	77.3	78.9	50.0
3 *	**Be aware of good and bad topical treatments for wounds.**	7.6	40.8	76.6	80.7	51.3
4 *	**Describe how to prepare an appropriate salt solution for cleaning wounds.**	0.0	7.3	39.8	60.5	26.9
5 *	**Be able to list three steps involved in cleaning wounds appropriately.**	3.9	19.3	41.0	42.6	26.7
6	**Recognise two signs of an early harness wound.**	0.0	0.0	0.8	3.5	1.1
7 *	**Select appropriate material as a base layer for the harness.**	0.0	0.0	8.6	48.2	15.5
8	**Describe three important features of the padding on the harness.**	0.0	0.9	8.6	5.3	3.8
9 *	**Describe an important feature of harness base layer care.**	10.4	17.4	33.6	43.9	26.3
10	**Recognise three disadvantages of your donkey having wounds.**	0.0	0.0	2.3	9.6	2.9

* = learning objective (with greater than 10% of participants improving) included in multilevel regression analysis

Table 5: Multilevel binary regression models showing the factors associated with improving knowledge at long-term follow-up in 476 participants in a c –RCT in Oromia region, Ethiopia.

	Odds ratio	Lower 95% CI	Upper 95% CI	P-value
Control	Ref			<0.001
Audio	6.01	2.35	15.38	
Handout	26.50	10.63	66.05	
Village meeting	23.97	9.43	60.94	
Age (years)	0.99	0.98	1.00	<0.001
Education				
No Education	Ref			<0.01
Adult Education	0.94	0.24	3.61	
Primary	0.52	0.21	1.29	
Junior	0.38	0.11	1.32	
Higher	1.04	0.39	2.79	
Learning objective				
LO3	Ref			0.02
LO2	0.97	0.37	2.55	
LO4	0.09	0.01	0.87	
LO5	0.50	0.21	1.16	
LO7	0.09	0.01	0.87	
LO9	1.43	0.65	3.19	
LO –intervention interaction				<0.001
a.LO2	1.26	0.43	3.73	
vm.LO2	1.47	0.49	4.46	
ho.LO2	1.23	0.39	3.87	
a.LO4	1.01	0.10	10.82	
vm.LO4	1.72	0.18	16.69	
ho.LO4	3.28	0.33	32.40	
a.LO5	0.62	0.24	1.63	
vm.LO5	0.35	0.13	0.89	
ho.LO5	0.24	0.09	0.64	
a.LO7	1.16	0.11	12.19	
vm.LO7	0.20	0.02	2.11	
ho.LO7	1.69	0.17	16.68	
a.LO9	0.20	0.07	0.54	
vm.LO9	0.08	0.03	0.21	
ho.LO9	0.09	0.03	0.24	
Education level - intervention interaction				0.02
a.adult_education	1.99	0.44	8.98	
vm.adult_education	2.28	0.52	9.93	
ho.adult_education	2.78	0.63	12.25	
a.primary_education	1.93	0.65	5.76	
vm. primary_education	3.74	1.34	10.39	
ho. primary_education	5.63	1.98	16.00	
a.junior_education	4.30	1.04	17.76	
vm. junior_education	4.51	1.11	18.36	
ho. junior_education	13.01	3.03	55.83	
a.higher_education	1.29	0.39	4.27	
vm. higher_education	1.98	0.58	6.75	
ho. higher_education	5.09	1.58	16.43	

Figure 2: Predicted probabilities for each intervention of getting a specific question correct across different education levels and learning objectives.

Figure 2a: Learning Objective 2

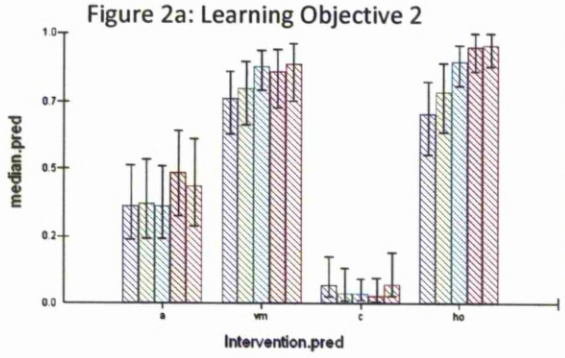


Figure 2b: Learning Objective 3

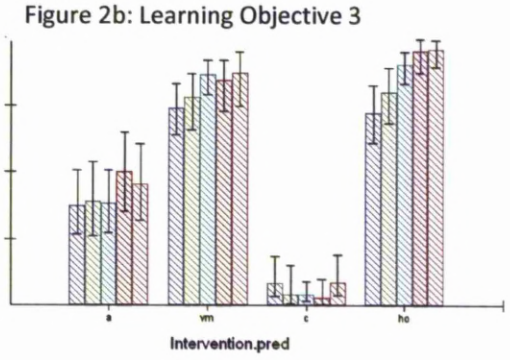


Figure 2c: Learning Objective 4

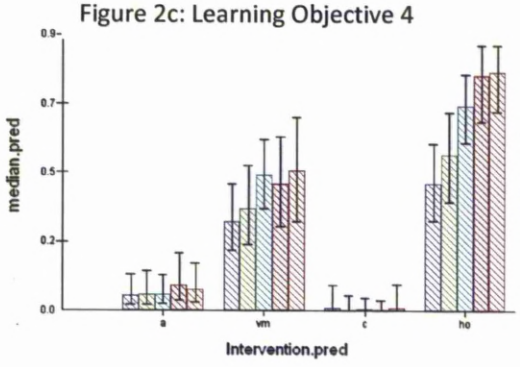


Figure 2d: Learning Objective 5

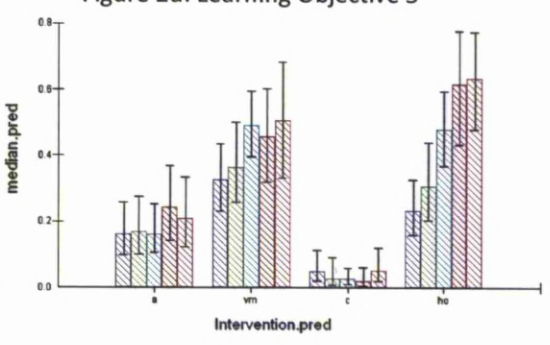


Figure 2e: Learning Objective 7

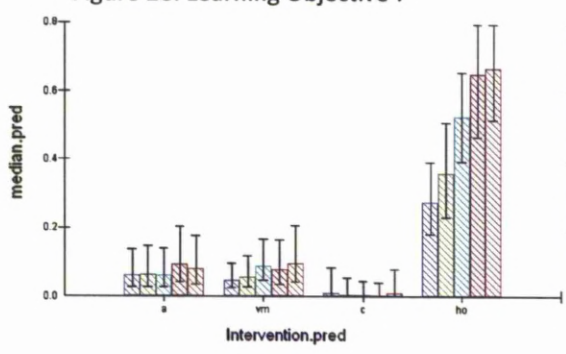
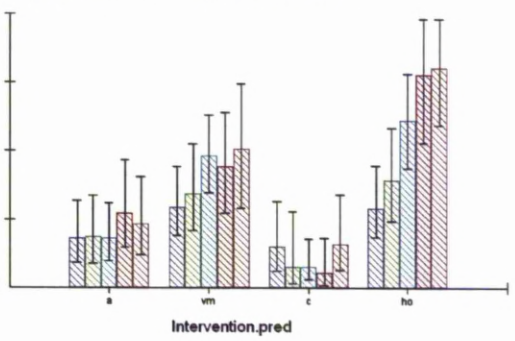
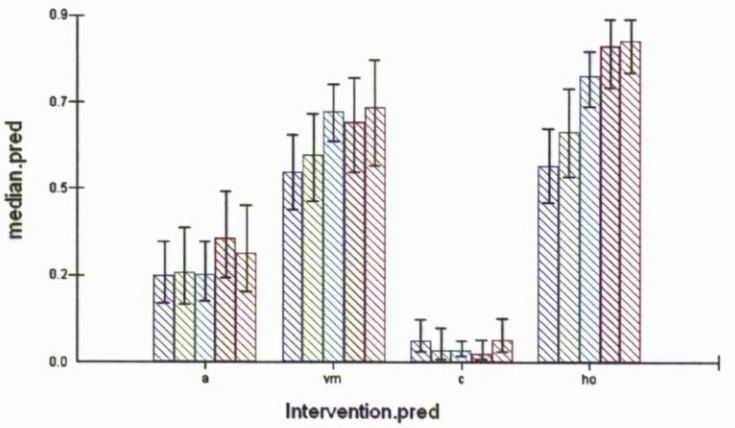


Figure 2f: Learning Objective 9



Key: a = audio, vm = village meeting, c = control, ho = handout. Education level and colour: No Education = Dark Blue, Adult Education = Green, Primary Education = Light Blue, Junior Education = Red, Higher Education = Purple

Figure 3: Predicted probability of a correct answer for intervention and education level across average learning objective



Key: a = audio, vm = village meeting, c = control, ho = handout.
Education level: No Education = Dark Blue, Adult Education = Green, Primary Education = Light Blue, Junior Education = Red, Higher Education = Purple

Qualitative evaluation analysis

The thematic codes to the qualitative questions are shown in Table 6. When asked what was the main message in the education programme, participants volunteered the answers under the 'How to care for donkey' theme most frequently. Participants responded with comments such as: *'how to care and use donkey properly'* and *'how to keep the donkey healthy and care for the future'*. Ranked second was 'Wound care and treatment', although this theme was volunteered most frequently in the village meeting intervention group. Participants responded with comments such as: *'how to make a simple treatment to treat the donkey'* and *'using simple things like salt and water and a plastic bag to clean wounds'*. The 'Harness change' theme was ranked third, with participants saying that they could *'prevent wounds by making a good harness'* and *'care for donkey by using a good harness and padding the rump strap'*. Other interesting comments to this question made by the participants included that *'the use of the donkey was for the whole family'* and that they now *'have a greater consideration for the donkey'*.

The most frequent response to the question concerning what aspect of the education would participants now do, was for the 'Harness change' theme. This was followed by 'Care and use of donkey' and 'Loading/Overloading'. With regards to the 'Harness change' theme, participants said that they *'pad the rump strap and use a good harness whilst*

loading' and *'use a thick harness to protect wound'*. There were very few responses from participants to the question concerning whether there was anything in the education programme they would not now do. The most frequent response was for the *'Different disease, different Treatment'* theme. Participants commented that *'if the donkey has a disease other than a wound, they wouldn't treat at home, they would take to the clinic'* and they *'wouldn't treat ear wound (wart) with salt and water'*.

The majority of participants (94.0%) who responded thought the interventions were 'good' or 'very good' with a minority answering in the 'Other' theme. The answers in this theme included comments such as it was *'difficult as it was in Afan Oromo'*. Participants were asked which aspect of the intervention was easy to understand. The most frequent response was for the 'Care and treatment of donkeys' theme followed by 'Making harness' theme. When asked what aspect of the intervention was not easy to understand, the most frequent response (74.3%) was for the 'Nothing/all clear' theme, whilst a minority responded with answers in the 'Educational difficulty/literacy/languages' theme, such as *'if I could read, everything would be clear'* or 'Treatment issues' such as *'the bad treatments, read again and again and asked others'*. When participants were asked at the end of the interview whether they had any other information about their donkey they would like to tell us, the most frequently volunteered response concerned 'Other disease and treatment issues' followed by comments concerning 'Use/status and care'. Participants commented that they *'need additional information about health of donkey and something here for health of donkey'* and the *'education was good for treating wounds, but other problems such as bloating (may die immediately) were not solved'*. With regards to the 'Use/status and care' theme, participants commented that *'donkeys have a lot of uses, especially for women' and that the 'donkey has a new status, equal to that of an ox...now fed as well as oxen'*.

The majority of participants had passed the information they received onto others. When asked who they had passed this information onto, neighbours, followed by relatives (family) were the most frequent responses. When asked specifically about whether they had changed the base layer (harness) since the education, the majority of participants (92.9%) responded that they had. The most frequently volunteered change was the use of a blanket, followed by clothes and then nylon or sisal sack filled with straw. Participants who received the handout intervention were asked whether they read the handout, 43 (38%) of 114 participants responded they had. For those that had not read it personally, their

children 39 (55%), followed by neighbours and friends 23 (32%) had read it to them. All 114 (100%) participants who had received the handout intervention still had possession of the handout.

Table 6: Thematically coded evaluation questions from participants (n=351) who received a knowledge transfer intervention.

Question 1: What is the main message you have learnt from this education	**Number of mentions (%)**			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
Role of donkey	4 (3.23)	3 (2.2)	6 (4.4)	13 (3.3)
How to care for donkey	50 (40.3)	47 (34.3)	63 (46.7)	160 (40.4)
Wound care and treatment	37 (29.8)	60 (43.8)	32 (23.7)	129 (32.6)
Treatment change and behaviour change	0 (0.0)	3 (2.2)	2 (1.5)	5 (1.3)
Harness change	28 (22.6)	21 (15.3)	24 (17.8)	73 (18.4)
Loading and overloading	5 (4.0)	3 (2.2)	8 (5.9)	16 (4.4)
TOTAL	124 (100.0)	137 (100.0)	135 (100.0)	396 (100.0)
Question 2: Was there anything in the education that you would now do for your donkey?	**Number of mentions (%)**			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
Care and use	33 (24.4)	48 (25.0)	51 (26.8)	132 (25.5)
Treatment	10 (7.4)	16 (8.3)	14 (7.4)	40 (7.7)
Harness change	74 (54.8)	91 (47.4)	94 (49.5)	259 (50.1)
Loading/Overloading	14 (10.4)	26 (13.5)	29 (15.3)	69 (13.3)
Other	4 (3.0)	11 (5.7)	2 (1.1)	17 (3.3)
TOTAL	135 (100.0)	192 (100.0)	190 (100.0)	517 (100.0)
Question 3: Was there anything in the education that you would NOT now do for your donkey?	**Number of mentions (%)**			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
Different disease, Different treatment	5 (83.3)	7 (58.8)	4 (50.0)	16 (61.5)
Harness issue	0 (0.0)	1 (8.3)	0 (0.0)	1 (3.8)
Build shelter	0 (0.0)	1 (8.3)	3 (37.5)	4 (15.4)
Other	1 (16.7)	3 (25.0)	1 (12.5)	5 (19.2)
TOTAL	6 (100.0)	12 (100.0)	8 (100.0)	26 (100.0)
Question 4: What did you think about the intervention that we gave about wounds on donkeys?	**Number of mentions (%)**			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
Good, very good,	104 (91.2)	127 (96.9)	114 (93.4)	345 (94.0)
Other	10 (8.8)	4 (4.0)	8 (6.6)	22 (6.0)
TOTAL	114 (100.0)	131 (100.0)	122 (100.0)	367 (100.0)
Question 6: What was easy to understand?	**Number of mentions (%)**			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
Care/Treatment of donkey	36 (36.4)	54 (42.5)	39 (33.6)	129 (37.7)
Make harness	27 (27.3)	43 (33.9)	31 (26.7)	101 (29.5)
Everything	5 (5.1)	8 (6.3)	7 (6.0)	20 (5.8)
Use/Care of donkey	19 (19.2)	11 (8.7)	18 (15.5)	48 (14.0)
Loading/Overloading	5 (5.1)	3 (2.4)	8 (6.9)	16 (4.7)
Site of wound	5 (5.1)	8 (6.3)	13 (11.2)	26 (7.6)
Other	2 (2.0)	0 (0.0)	0 (0.0)	2 (0.6)
TOTAL	99 (100.0)	127 (100.0)	116 (100.0)	342 (100.0)

Table 6 (continued): Thematically coded evaluation questions from participants (n=351) who received a knowledge transfer intervention.

Question 7: What did you not understand?				
	Number of mentions (%)			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
Nothing/all clear	25 (62.5)	40 (80.0)	42 (77.8)	107 (74.3)
Harness	2 (5.0)	1 (2.0)	0 (0.0)	3 (2.1)
Educational difficulty/literacy/language	7 (17.5)	1 (2.0)	7 (13.0)	15 (10.4)
Other treatment issues	4 (10.0)	4 (8.0)	5 (9.3)	13 (9.0)
Sites/causes of wounds	2 (5.0)	4 (8.0)	0 (0.0)	6 (4.2)
TOTAL	40 (100.0)	50 (100.0)	54 (100.0)	144 (100.0)
Question 8: Have you passed on the information onto anyone else?				
	Number of mentions (%)			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
No	18 (16.7)	15 (11.9)	18 (15.7)	51 (14.6)
Yes	90 (83.3)	111 (88.1)	97 (84.3)	298 (85.4)
TOTAL	108 (100.0)	126 (100.0)	115 (100.0)	349 (100.0)
Question 9: Who have you passed the information onto anyone else?				
	Number of mentions (%)			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
Relative/family	30 (26.3)	24 (18.8)	21 (18.8)	75 (21.2)
Neighbour	69 (60.5)	76 (59.4)	70 (62.5)	215 (60.7)
Friends	10 (8.8)	9 (7.0)	13 (11.6)	32 (9.0)
Village /Community group/Peasant Association	2 (1.8)	15 (11.7)	6 (5.4)	23 (6.5)
Secret, not told/told not to tell	3 (2.6)	4 (3.1)	2 (1.8)	9 (2.5)
TOTAL	114 (100.0)	128 (100.0)	112 (100.0)	354 (100.0)
Question 10: Any other information about your donkey you would like to tell us?				
	Number of mentions (%)			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
Other disease/treatment issue	16 (43.3)	32 (54.2)	25 (35.7)	73 (44.0)
Use/status and care	13 (35.1)	21 (35.6)	25 (35.7)	59 (35.5)
Education issue	4 (10.8)	3 (5.1)	14 (20.0)	21 (12.7)
Feeding/climate issue	0 (0.0)	0 (0.0)	4 (5.7)	4 (2.4)
Other (castration, stolen, shelter)	4 (10.8)	3 (5.1)	2 (2.9)	9 (5.4)
TOTAL	37 (100.0)	59 (100.0)	70 (100.0)	166 (100.0)
Question 11: Have you changed your donkeys baselayer since our education				
	Number of mentions (%)			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
No	13 (11.9)	4 (3.1)	8 (7.0)	25 (7.1)
Yes	96 (88.1)	123 (96.9)	107 (93.0)	326 (92.9)
TOTAL	109 (100.0)	127 (100.0)	115 (100.0)	351 (100.0)
Question 12: To what have you changed your baselayer?				
	Number of mentions (%)			
Thematic codes	**A**	**VM**	**HO**	**TOTAL**
Blanket	40 (33.9)	90 (44.8)	82 (45.1)	212 (42.3)
Clothes	40 (33.9)	60 (29.9)	45 (24.7)	145 (28.9)
Gabbi	8 (6.8)	10 (5.0)	27 (14.8)	45 (9.0)
Sisal/nylon sack + straw	21 (17.8)	32 (15.9)	20 (11.0)	73 (14.6)
Other	9 (7.6)	9 (4.5)	8 (4.4)	26 (5.2)
TOTAL	118 (100.0)	201 (100.0)	182 (100.0)	501 (100.0)

Discussion

A limited number of studies have attempted to utilise randomised controlled trials to assess the impact of knowledge-transfer interventions on their target populations (Bell et al., 2005, Grace et al., 2008). In this study (the long-term follow-up), all interventions improved the knowledge of our target audience approximately 6 months post-intervention. Overall, the handout was the most effective intervention, followed by the village meeting and then the audio programme. This finding was consistent in both the linear and logistic regression models. Logistic regression models were utilised to assess whether learning was different across different types of questions and learning objectives. The handout and village meeting interventions improved the continuous scores over twice as much as the audio intervention. This is largely consistent with the outcomes seen two weeks after a follow up questionnaire (Chapter 4 and Stringer et al., 2011). However, the change in knowledge in participants who received the village meeting or audio programme was smaller at the long-term follow-up, than at short-term follow-up. The handout, however, produced a marginally greater change in knowledge at the long-term follow-up than it did at the short-term follow-up. Given that the interventions were not repeated (village meeting and audio programme), some decrease in knowledge would be expected over a time and therefore could explain the reduction in knowledge at long-term. This is consistent with the study by Grace et al., 2008, in which the change in farmer's knowledge decreased from that seen at the two week follow-up (31%), to 19% at the five month follow-up. The handout intervention was the only intervention that remained with the participants and therefore could have been referred to by participants prior to the follow-up, or at any time in between. This could have reinforced their knowledge on the subject matter, and therefore may explain the increase in knowledge at long-term follow-up from that seen at short term follow up.

The final linear regression model showed that the age of the participant and pre-intervention score (baseline knowledge) had an effect on the outcome variable (change in continuous score). The effect of age also varied across interventions and was more pronounced in participants that had received the handout. The handout performed most effectively amongst younger participants, whilst in the older participants the village meeting was most effective. Again, this finding is consistent with the findings seen in the two-week follow-up (Chapter 4 and Stringer et al., 2011). Desjardins, (2003) suggested that older age groups have lower literacy proficiency than younger adults, most likely as a result

of younger adults having received more extended formal education and having received that formal education more recently than older adults. Lower literacy proficiency could potentially result in a reduced ability for knowledge acquisition from knowledge-transfer interventions requiring literacy and/or visual literacy such as a handout.

For the logistic regression model, the outcome measure used was a binary variable reflecting whether knowledge improved for each of the 12 individual questions. There were four possible outcomes for knowledge change: the participants got the question incorrect at pre and post-intervention, the participant got the question correct at both pre and post-intervention, the participants got the question correct at pre-intervention and then incorrect at post-intervention or the participant got the question incorrect at pre-intervention and then correct at post-intervention. For this analysis, only where participants answered incorrectly at the pre-intervention questionnaire and correctly at the post-intervention questionnaire were they deemed to have improved knowledge, this study considered this to be the most conservative assessment of knowledge change that could be attributed to the intervention. It could be argued that participants that got the question correct at both pre and post-intervention should have been classed as a positive outcome. For most questions the numbers in this category were small and would therefore have little effect on the findings.

The final three-level logistic regression model revealed that learning also varied by age, learning objective and education level, with significant interaction terms in the model, with the effects of the interventions being different across different learning objectives and different education levels.

The use of defined learning objectives to design and develop the three specific knowledge-transfer interventions was crucial as they ensured the content of each of the interventions was consistent, could be objectively evaluated and provided an overview of what the 'learner should have achieved and what should be assessed' (Ramhani, 2006; Harden, 2002). This has been discussed in greater in detail in Chapter 4 and Stringer et al., 2011.

This study identified variation in learning between learning objectives and that this varied by intervention. It was hypothesised that the question topic (Table 1) would have an influence on how well participants learnt and that the participants would have a greater knowledge change in the "treatment" question topic compared to the other question topics. The three learning objectives that related to "treatment" all revealed a significant

change in knowledge in the intervention groups when compared to the control group. In contrast, at least one learning objective in each of the other three question topics (causes/sites, prevention and relevance) was excluded from the model due to the very small number (less than 10%) of participants improving at long-term follow-up on that learning objective. Only one of the three learning objectives (learning objective 2) associated with the "causes/sites" question topic had greater than 10% of participants improving their knowledge. Learning objective 2 required owners to identify the four common sites of wounds, and this was answered particularly well following the village meeting and handout interventions, with an overall improvement across all interventions of 50% of participants. The single visual aid that was used in both the handout and village meeting to teach this learning objective was designed to be clear, concise and easy to understand. By contrast, the other two learning objectives in the "causes/sites" question topic (learning objectives one and six) performed badly. During the pilot work, owners were aware of some causes of manmade wounds on their donkeys, but were unaccustomed to recalling them all in one occasion and also unaccustomed to drawing causal connections between wounds and the locations of wounds. To get this question, and this learning objective, correct participants would have to have answered with four correct causes. Many participants were able to mention a number of causes, but could not volunteer all four. For learning objective 6, participants were required to answer that both pain and hair loss were two of the early signs associated with a harness wound. Following interventions, many participants (n=276) were able to answer hair loss, however only a few (n=5) were able to answer pain.

Learning objective 8 (a prevention question), was answered correctly by less than 10% of participants. This learning objective required participants to correctly describe three important features of the padding on the harness. Again, many participants could name one or two of these features, but were unable to name all three features. The "relevance" question topic was represented by only one question (and learning objective). This learning objective (10) required participants to recall three disadvantages to their donkey having wounds. Again, very few individuals could recall all three correct responses. This learning objective was always taught last in each of the three interventions and this may be another factor that influenced the poor response seen from participants to this question. Overall, the most effective question topic in the three intervention groups was "treatment", with 47.9% of participants improving in this question topic compared to "causes/signs" (25.9%), "prevention" (18.6%) and "relevance" (3.7%).

During the evaluation questionnaire, participants were asked to volunteer what they thought was the main message in the education programme. The most frequent response was for 'How care for donkey', followed by 'Wound care and treatment'. This latter theme was the most frequently volunteered response from participants in the village meeting intervention group, compared to other themes. This is consistent with the results seen in the binary multilevel model analysis, where learning objectives three, four and five (the Treatment question topic learning objectives) are answered correctly by 76.6, 39.8 and 41.0% of participants in the village meeting intervention groups respectively. The qualitative data collected here supports the quantitative data suggesting that the village meeting intervention taught the treatment section of the intervention effectively. The most frequent response to the question concerning what aspect of the education would participants now do, was for 'Harness change' theme. With regards to 'Harness change', participants described harness improvements or modifications that they will do, or and are now doing. It is interesting to note that 'Harness change' was not seen as one of the top two main messages of the programmes, but was volunteered as the first issue owners have changed. This finding is supported by the responses given by participants when asked about whether they had changed the base layer (harness) since the education. The majority (93%) responded that they had; with the most frequently volunteered change being the use of a blanket, followed by clothes and then nylon or sisal sack filled with straw.

There is one obvious difference noted between the quantitative study (where the treatment section of interventions was learnt most effectively), and the qualitative study (where owners responded that they would change the harness as the most frequent response to what aspect of the education they would now do). One potential explanation for this is that although the treatment section of the interventions was learnt most effectively, changing the harness is a preventive measure owners can take before their donkey gets a wound and needs treatement. Therefore owners may have learnt about treatment more effectively, but are more inclinded to take preventive measures to stop wounds occurring, rather than waitng for them to occur and treating them. However, the reliability of participant information (and thus actual behavioural change) was not validated and may be imperfect or biased by participant reporting of perceived correct answers.

The target population in this study was expected to have both low levels of formal education and literacy (in both regional languages: Amharic and Afan Oromo), and the design and development phase of the knowledge-transfer interventions aimed to take

account of this (Chapter 4). This influenced the decision to produce a handout that was predominantly pictorial and diagrammatic in design. The participants in this study were found to have low levels of literacy, with a higher percentage of participants unable to read Afan Oromo than Amharic. However, the decision was taken to design the interventions in Afan Oromo, based on advice from local contacts, as this is currently the official language of the region, the language currently being taught in the region's schools and the language that the majority of our target population communicate in (despite being illiterate in this language). Participants who received the handout intervention were asked whether they had read the handout, 43 (38%) of 114 participants responded they had. For those that had not read it personally, their children 39 (55%), followed by neighbours and friends 23 (32%) had read it to them. Children in this region currently attending school would be taught in Afan Oromo, and consequently would be literate in Afan Oromo during early primary education. All 114 (100%) participants who had received the handout intervention claimed to still have possession of the handout. The visual literacy of the target audience was also unknown prior to the piloting phase and is discussed in greater detail in Chapter 4 and Stringer et al., 2011. In brief, visual literacy relates to the ability of an individual to accurately interpret and understand an image before them (Linney, 1995), and where possible interventions should depict local situations and settings from the daily lives of the intended target audience (Harford and Baird, 1997).

The success of the handout in this study highlights that the efforts made during the development and piloting phases resulted in an intervention that was, at least to some extent, appropriate and understandable to the visual literacy level of the study population. However, the effect of the handout did appear to vary with the age of the participant. The handout was more effective in younger participants than older participants even though efforts had been made to ensure the intervention was predominately image-based with limited text. The older participants in this study may have lower levels of literacy, visual literacy and even visual ability, and will have had a longer period since formal schooling, leading to less knowledge acquisition. Interestingly, the mean age (57 years) of the lowest education group (no education) was 20 years older than the mean age (37 years) of the highest education group (higher education).

Participants with higher education levels generally performed better, however this effect was most pronounced in the handout intervention, followed by village meeting with little effect in the audio intervention. For the majority of learning objectives, the knowledge

change amongst highly educated participants receiving the handout intervention was greater than that for the lower educated participants. Future knowledge-transfer programmes may need to be delivered using more than one medium, and may consider adopting village meeting formats for older and less formally educated individuals, whilst handouts could be utilised for younger and more formally educated individuals.

In the linear regression model, the variance at the village-level was small compared to variance at the individual participant-level and accounted for only 4.6% of the total variation. This is consistent with the village level variance found at the short-term follow-up, where village-level variance accounted for only 4.2% of the total variation. The variation in the logistic model at the village-level was very small compared to the variance at the individual level and accounted for only 3.0% of the total variation. These consistent findings across all models suggest that the majority of the variation that exists can be attributed to the differences between individuals in this study (perhaps due to literacy levels or other factors not measured in this study) rather than differences between villages

It is possible that the combination of an oral presentation with demonstrations and visual images (village meeting) was likely to have accommodated all levels of literacy, visual literacy and language issues. Immediately after the village meeting there was a question and answer session, this allowed participants an opportunity to clarify any areas of confusion or any missed messages in either language. The audio programme required no literacy ability, and was designed to simulate a possible future radio broadcast. A previous study by Farr et al., (2005) has shown high levels of radio ownership amongst Ethiopian households, with regular radio listeners. This is consistent with this study which showed that 80% of participants had access to radio on a daily basis. Chapman et al., (2003) found that radio formats that involved drama sketches performed by local actors were most popular amongst farmers listening to agricultural extension programmes, and that for maximum impact, the programme format should incorporate ways in which the intended target audience discuss problems in their own communities, and provide relevant information in a suitable context. This was demonstrated in our study by participants volunteering information about the storyline of the programme and the characters names. In this study the audio programme was only played once to the participants, as such the authors did not explore the potential benefits to increased knowledge acquisition by repeat exposure to the intervention. The efficacy of this format was shown to be greatest amongst uneducated (no formal education) villagers in The Gambia (Valente et al., 1994). However,

in this study there was no significant difference in the predicted probability of volunteering a correct answer for the audio intervention across education levels. Although the radio programme produced the smallest change in knowledge, when compared to the other two interventions it still significantly improved knowledge when compared with the control villages, The benefits of a successful audio intervention are its ability to 'reach' thousands of individuals and households in a local language (many of whom may be illiterate) with relative ease of administration and low cost. These benefits may therefore outweigh the greater knowledge change efficacy seen in more labour intensive interventions. The benefits may be enhanced through repeated exposure to the intervention (i.e. through repeated broadcast) and this should be further evaluated.

One of the inclusion criteria for this study was gender, with only males being selected for participation. Although a potential criticism of this study, this decision was based on information gathered during the pilot phase that identified an existing male dominated hierarchy within Ethiopian households and has been discussed in greater detail in Chapter 4 and in Stringer et al., 2011. In the evaluation questionnaire, the majority of participants responded that they had passed the information they received on to others. When asked who they had passed this information onto, neighbours, followed by relatives (family) were the most frequent responses. It is therefore hoped that any knowledge transferred to males in this study will have been disseminated to other family members (including females). With regards to the 'Use/status and care' theme, participants commented that *'donkeys have a lot of uses, especially for women'* and that the *'donkey has a new status, equal to that of an ox...now fed as well as oxen'*. During many discussions with owners during the Participatory Situation Analysis (PSA) (Chapter 2), owners commented on the low status of the donkey within their villages. It is therefore worth highlighting this statement above (one of many) where owners reported an increase in the status as a positive change in attitudes towards this species.

Data in this study were collected during questionnaire interviews with individual participants in either of the two local languages. The questionnaire used for evaluating a change in knowledge (476 participants) utilised concise questions, many requiring only single word answers. The questionnaire used on only intervention villages (351 participants) to gather qualitative information regarding the intervention programme produced largely one sentence responses. The accuracy of all information gathered during these questionnaire interviews must be considered carefully, especially as all information

gathered went through a translation process. The reliability of information volunteered by participants was not validated and therefore may be imperfect or biased by participant reporting of perceived correct answers. Further discussion in the study design utilised in this trial and its effect on any bias or measurement error is discussed in Chapter 4 and Stringer et al., 2011. Another consistent finding to that seen at the short-term follow-up is that the average improvement for a participant in the control group was only 0.8 marks and this change was not significant. Hence, as seen in the short-term follow-up, there was no evidence of the 'Hawthorne-type Effect', which occurs when there is a change in respondents (behaviour) as a result of their involvement in the study, rather than due to the specific intervention (Jones, 1992).

This study was designed to measure knowledge change within a target population (with all three interventions showing effective increases in knowledge when compared to the control intervention). Changes in attitudes and behaviour were not specifically measured in this study, although both the attitudes of owners towards the education programmes (94% responding that the intervention was very good or good) and their intended or implemented behavioural changes were explored qualitatively. The qualitative information collected identified an intention to change behaviour or reported behaviour change (with 93% reporting they have changed their donkey's baselayer since the education), although the authors did not validate this information. The knowledge-transfer programme utilised in this study could be considered an initial step towards behaviour change, with other components such as skills development, attitude development and motivational support being required (Mitchell et al., 2001).

Conclusion

Knowledge-transfer interventions developed for rural equid owners (rural farmers) in this region of Ethiopia should consider the formal education level, and age of intended target audience as key issues, along with intervention type and the educational learning objectives. This study showed that a handout, based primarily on visual images, designed and piloted with the intended audience was shown to be the most effective intervention, particularly in younger and higher educated participants. The village meeting intervention, with direct contact between a specifically trained animal health worker and participants, in combination with a mixture of visual demonstrations, presentations and a question and answer session was also effective. Ethiopia, with its large population of working equids

(and livestock) is ideally placed to benefit from appropriate animal health knowledge-transfer programmes. The results from this study may be beneficial to other populations of livestock owners, particularly in sub-Saharan Africa, however, it is likely that different issues associated with learning across different communities may exist, and these must be carefully considered when designing programmes and ideally evaluated and explored during initial phases of any study using appropriate methods such as participatory situation analysis.

CHAPTER SIX:

General Discussion

This thesis presents new findings concerning Ethiopian working equid owners' perceptions and knowledge of disease and health problems, the associations between sources of information and animal health knowledge, and the efficacy of knowledge transfer interventions on the knowledge of equid owners at both short and long-term follow-up. A combination of approaches (participatory, qualitative and quantitative) have been utilised throughout this thesis to ascertain as accurate a representation of the situation as was feasibly possible. Chapter 2 utilised participatory methodologies to explore owners' perceptions and knowledge of the disease and health problems affecting their working equids. Information from this then informed the content of the interventions used in a cluster-randomised controlled trial (Chapters 4 and 5), to evaluate the efficacy of different knowledge-transfer interventions on increasing the knowledge of working equid owners on a specific subject: wounds and wound management. In Chapter 3, the different sources that owners used to ascertain information concerning working equid healthcare and husbandry, and their associations with owners' knowledge was explored. This discussion brings together key findings from each chapter, identifies potential limitations within this research and highlights areas for further research and investigation.

Chapter 2 attempted to ascertain owners' knowledge and perceptions of disease and health problems afflicting their working equids using a Participatory Situation Analysis (PSA). Triangulation of the information gained from this with non-governmental organisation (NGO) clinic data and other studies allowed a detailed picture of the situation to be presented. Results from this study were largely in agreement with disease and health problems identified by veterinarians (NGO clinics) and by previous studies with some novel findings. This study compliments previous studies by focussing on owners' knowledge and perceptions of working equid health and disease problems. In this chapter, as also highlighted in the literature review in Chapter 1, owners reported that their working equids had many uses and that disease and health problems affected not just their income but their lifestyle. It became apparent during early piloting that it was necessary to consider owners of working equids as two different groups: those owners who own donkeys and those that own horses. Differences in these two groups were apparent during the PSA, not just in the locations they reside, or the main use of their equids, but also with regards to the disease and health problems that affect their equids. These disease and health problems also had differing socio-economic effects on owners, and the potential approaches to improve equid health, wealth and productivity would need to differ to address the differences in these groups.

Owners were able to volunteer a number of problems affecting their animal's health, and for a number of these problems were able to identify differing clinical severities. Problems were volunteered in the local languages (Amharic or Afan Oromo), and were sometimes specific to a disease, whereas at other times they described a visible clinical sign or perceived cause of the disease. There was strong agreement between the problems donkey owners volunteered most frequently (wounds, coughing and nasal discharge) and existing information on donkeys in Ethiopia and other developing countries (Sells et al., 2009; Burn et al., 2007; Curran et al., 2005; Pritchard et al,. 2005; Getachew et al., 2002, Powell 2002). There was also agreement between the problems horse owners volunteered most frequently (Epizootic Lymphangitis, coughing and colic) and clinic treatment data from a veterinary NGO (Scantlebury et al., 2010; SPANA, 2005; SPANA personal communication). Epizootic Lymphangitis (EZL) has previously been documented as the number one health concern for owners in their horses (Scantlebury et al., 2010), and this was supported by findings from the PSA in Chapter 2. Wounds have been previously documented as the highly prevalent health problem in donkeys in Ethiopia and other developing countries (Sells et al., 2009; Burn et al., 2007, Curran et al., 2005, Pritchard et al., 2005) and triangulation with the findings from Chapter 2 informed the decision to use this subject (wounds and wound management) as the content of the knowledge-transfer interventions evaluated in Chapters 4 and 5. Other disease and health problems volunteered by both donkey and horse owners were largely in agreement with problems previously reported.

There were a number of disease and health problems of donkeys and horses that were not in agreement with previous studies and reports. Rabies in donkeys was ranked by owners in the top five diseases and health problems, and yet this disease is not commonly seen in cases presenting at NGO clinics or in other studies (Pritchard et al., 2005; Tesfaye and Curran, 2005). Reasons for this could include: clinical cases dying before presenting at clinic or owners recognising clinical signs and abandoning or performing euthanasia. There is little published literature on rabies in donkeys and donkeys are often not included in studies estimating the burden of rabies in animal populations (Knobel et al., 2005). There was also an obvious discrepancy between owner reported prevalence of wounds in horses and the prevalence of wounds seen by NGO clinics and in previous studies (Biffa and Woldemeskel, 2006; SPANA, 2005). One possible reason for this may be that owners do not perceive wounds to be a problem in horses as they rarely affect their ability to work. The musculoskeletal syndrome ('bird') reported by horse owners has not been positively identified as a specific disease, but the clinical signs suggest possible disease pathologies

including equine exertional rhabdomyolysis. This syndrome has been previous reported in a different participatory study with carthorse owners (Scantlebury et al., 2010). Further research and investigation is warranted to fully understand the situation with regards to these specific disease and health problems, and their socio-economic impact on owners and communities. Examples of specific areas meriting further work are: robust cross-sectional and cohort studies to ascertain accurate disease prevalence and incidence estimates, respectively, economic studies to identify the cost of disease and health constraints to working equid owners and epidemiological studies (including case control studies) to determine causes of respiratory disease in working equids.

Many disease and health problems were described by just a single clinical sign with owners appearing unaware of the causal disease entity and this is perhaps an area for an educational intervention. A limitation with this PSA was the fact that it was carried out in another language and that during translation certain finer details may have been lost or missed. PSA findings were all based on owners reported knowledge and perceptions and, due to logistical constraints, the study was unable to verify the accuracy of this information by examining their animals directly. These findings could also be validated using more traditional epidemiological study designs, as research into the disease and health problems of working equids in Lesotho found a strong correlation between participatory and traditional epidemiological approaches (Upjohn et al., 2012). This chapter highlighted the invaluable local and indigenous knowledge that exists within communities with regards to animal health and disease (Admassu and Shiferaw, 2011; Scantlebury et al., 2010; Tesfaye et al., 2005) and also identified important cultural issues which need to be considered and utilised when designing interventional programmes (Oakley and Garforth, 1985).

The information sources that working equid owners utilise for health and husbandry information are potentially important, and a greater understanding of their interactions with these formal and informal sources can help to develop appropriate knowledge-transfer pathways for animal health interventions. These sources of information were explored in Chapter 3. Rural Ethiopian farmers (working donkey owners) volunteered numerous sources for information regarding health and husbandry advice for donkeys. These included family, friends and neighbours (strong ties) and those such as private drug suppliers, governmental agricultural bureaus and veterinary NGOs (weak ties). These findings were consistent with a previous study which had identified numerous sources of information available for Ethiopia farmers (Tesfaye et al., 2005). Other studies with farmers

in Africa have also revealed a similar situation: Sseguya et al., (2012) found rural community members in Uganda accessed information on a range of rural issues from an array of sources, and a study by Hogset (2005) with Kenyan smallholders found that all respondents listed family, neighbours and friends as people they discussed farming issues with. One interesting finding is the reduction in the percentage of owners who volunteer the governmental agricultural bureau as a source of information when they also have access to a veterinary NGO. NGOs have the potential to undermine local service providers and create dependency through the provision of free services (Pritchard, 2010). Reciprocity was not measured during this study, so the direction of information was only measured in one direction.

Further work investigating owner motivations for utilising certain information sources would have been useful, as previous work has suggested reliability/accuracy, timeliness and accessibility are the most important criteria for farmers (Tesfaye et al., 2005). From the individual interviews and the group PSA, strong ties were contacted on a more regular basis than weak ties. This is likely to be a result of the differing information needed from each source and the availability of each source. The cross-sectional study in Chapter 3 also revealed that owners contacted the traditional healer most frequently for information, ahead of the agricultural bureau. In this study 40.3% of individuals reported contacting the agricultural bureau for information, compared to 23% of Ethiopian farmers who reported having contact with a government extension agent (Mogues et al., 2009). Owners revealed that that they perceived these information sources (traditional healer and agricultural bureau) to be unreliable; highlighting a real concern about the accuracy and validity of the information they were being provided. This is a particularly relevant finding, given that the reliability of information often goes hand in hand with its application (Sseguya et al., 2012). This finding is in stark contrast to a study by Mogues et al., (2009) which found that 92% of men and 94% of women were satisfied with the extension advice they had received. However, only 8% of individuals responded that they had changed their activities and tried something new in the previous two years. Therefore successful interventions may potentially not be applied by rural farmers (working equid owners) in Ethiopia if the source of information is perceived to be unreliable and inaccurate (Sseguya et al., 2012).

Chapter 3 also explored the associations between donkey owners' knowledge on wounds and wound management and a number of demographic variables. Cluster analysis of the participants based on their volunteered contact with information sources suggested six

clusters (each representing a type of individual based on those that seek different information sources). The baseline knowledge score of owners increased as the number of sources contacted increased, suggesting that individuals who seek information know more about wounds and wound management than individuals that do not seek information. With regards to knowledge score, it may be that specific sources are important, or that there is something different about the individuals who seek information or seek it more widely. Knowledge score was greater with increasing education level, literacy ability and radio access. There was also a significant association between knowledge score and age, with knowledge score decreasing in older individuals. Multilevel linear regression models revealed formal education level, cattle ownership, whether a participant gives advice to other donkey owners and washes and cleans wounds on his donkey had a significant effect on the knowledge score (outcome variable). The relationship between knowledge and individual farmer variables is complex and requires further investigation to fully understand and identify potential casual pathways. It is unlikely that farmers in this study cluster together as a result of their knowledge on wounds and wound management of donkeys; a more likely explanation in this study is that farmers are in clusters with individuals who are more similar to each other as result of other demographic characteristics, such as education level or cattle ownership (an indicator of wealth).

Cluster group did not have a significant effect on knowledge score, however, when the education level variable was removed and the cluster group variable forced in as a fixed effect, cluster group was significant. It appears that education level is therefore correlated or associated with cluster group, with cluster group potentially a proxy measure of education level or vice versa. In the current study, 14.3% of individuals had received an adult education programme, 60.9% of individuals had undergone formal education (primary level or greater) and 24.8% of individuals had never received any education. It is likely that education level is an important factor in driving information exchange and adoption of new ideas, and that improving basic education and literacy levels amongst rural Ethiopia farmers will improve the efficacy and impact of potential development interventions. Previous studies have identified the importance of education to the adoption of agricultural practices and technologies (Tesfaye et al., 2005; Weir and Knight, 2000; Yohannes et al., 1990;). If education levels vary geographically, there is a need to carefully consider the utilisation of different interventions in different areas.

A limitation in this study was the lack of focus on social groups and organisations. These groups and organisations play a valuable role in Ethiopian rural communities and can be an important source of information for farmers (Davis et al., 2004; Seboka and Deressa, 1999). Further research and investigation into their role would have added greater value to this study. With owners reporting that they seek information from governmental agricultural bureaus, strengthening the capacity of these service providers as sources of accurate and reliable information could potentially be important for increasing the success of knowledge transfer.

Once a source of information has been identified, information has to be transferred in an effective way to increase the knowledge of the owner on a given subject matter. In Chapters 4 and 5, three different knowledge-transfer interventions were evaluated utilising a cluster-randomised controlled trial (c-RCT) to measure their efficacy on increasing owner knowledge on a given subject (wounds and wound management in donkeys). Knowledge change was evaluated after approximately two weeks (to assess short-term knowledge change), and after approximately six months (to assess long-term knowledge change). The decision to choose two weeks as the interval to evaluate short-term knowledge change was based on previous studies in the literature evaluating the affect of animal health educational interventions on animal owners in Africa (Grace et al., 2008, Bell et al., 2005). Longer term knowledge change was evaluated to ascertain whether knowledge faded, as previous demonstrated in one study with cattle owners in Mali (Grace et al., 2008) and whether this knowledge fade differed with interventions that remained with the owner, such as a handout, versus those administered once (such as the village meeting) . Learning objectives were utilised during the design, development and evaluation off all interventions (Ramani, 2006). These became crucial in ensuring the content in all interventions were consistent and in evaluating which aspects of each intervention were effective. All interventions improved knowledge (measure by a change in score) at short-term and long-term follow-up. The village meeting was the most effective intervention at short-term, with the handout being the most effective intervention at the long-term follow-up. At both short and long-term follow-ups, the handout and the village meeting were significantly better than the audio programme. The effectiveness of the handout as a knowledge-transfer intervention is consistent with a previous randomised controlled trial with smallholder farmers in Tanzania (Bell et al., 2005) and cattle farmers in Mali (Grace et al., 2008). Handouts are an affordable and easily distributable method of extension with potential added valued as an educational resource (both visual and text) for children and

adults who may have limited access to learning resources. However, it is worth remembering that the handout utilised in this study underwent extensive development and pre-testing prior to use, and for future handouts to be effective, consideration must be given to this process.

With the exception of the handout intervention which remained with participants during the trial, the two other interventions (village meeting presentation and radio programme) were only exposed to participants once. Consequently, this study did not evaluate the effectiveness of multiple exposures to an intervention and therefore what potential benefit (or increased knowledge) may have resulted. This may have been especially beneficial for the radio intervention, with one participant commenting that for this intervention to be successful for old men, it should be repeated a number of times. The potential benefit of the audio intervention lies in its ease of administration and its reach, given our finding that 80.0% of owners in the cross-sectional study had access to a radio on a daily basis.

Age and baseline knowledge score were significant in the final models at both short and long-term follow-up. There was a significant interaction between the age of a participant and their change in score, although this varied across intervention, being most pronounced in the handout intervention. The handout intervention performed more effectively in younger participants, whilst the village meeting intervention performed better in older participants. Older participants had lower baseline knowledge scores and smaller changes in knowledge (i.e. they learnt less). This is potentially a result of lower education levels (the median participant age increased in lower education levels), and issues concerning literacy, visual literacy, visual ability and the time period since last receiving education.

Multilevel logistic regression models in Chapter 5 revealed that learning also varied by age, learning objective and education level, with the effects of the interventions being different across different learning objectives and different education levels. There was a difference in learning across interventions, with the handout and the village meeting the most effective interventions, although this varied across learning objective. There was also a difference in learning across education level, with more educated participants performing better, however this effect was most pronounced in the handout intervention, followed by village meeting with little effect in the audio intervention. Overall, the most effectively taught topic appeared to be related to "treatment", with the "prevention" topic being taught the least effectively. The "treatment" topic may have been learnt most effectively

by participants because it was perceived to be the most important (and relevant) of the information communicated in the programme. It may also be a result of intervention design (e.g. more easily understood images, clearer wording or chronological position in intervention programme). A study by Bell, (2002) on mastitis knowledge in smallholder farmers in Tanzania revealed that questions concerning "signs", "effects" and "spread" were answered better than those on "prevention of mastitis".

Participants were only deemed to have successfully improved their knowledge in the binary outcome models if they answered incorrectly on questions in the pre-intervention questionnaire and correctly on questions in the post-intervention questionnaire. This was deemed the most conservative assessment of knowledge change (and the most effective at attributing knowledge change to the specific intervention), and so consequently participants who may have known the correct answer at the pre-intervention stage were not deemed to have improved their knowledge. This is a different methodology to a previous study evaluating knowledge change in Tanzanian smallholders, which evaluated the volunteering of a correct response post-intervention, irrespective of the response participants had given pre-intervention (Bell, 2002). Questions were also only marked correctly if all the individual parts were answered correctly, again the most conservative assessment of knowledge, as even if participants correctly answered three parts correctly but one part incorrectly the question was marked incorrect overall as the participants were deemed not to have fully achieved the related learning objective. Taking this into consideration, the study has therefore demonstrated that all interventions were indeed successful in terms of effecting knowledge change, and that the overall change in knowledge amongst the study population may in fact be greater than the conservative results which we have presented.

All three knowledge-transfer interventions utilised in the c-RCT were effective with varying levels of success. This trial highlights the need to tailor-make interventions for the intended audience and context in which they will be used to increase knowledge-transfer. Future knowledge-transfer programmes may need to be delivered using more than one medium, and may be more effective if the village meeting format is utilised for older and less formally educated individuals, whilst handouts are utilised for younger and more formally educated individuals.

The decision to use Afan Oromo as the language in all interventions was based on its use as the official language of the region, the language currently being taught in schools and the language with which the majority of our target audience communicate (even if illiterate in this language). It would have been interesting to have evaluated the effectiveness of interventions if the study had used Amharic as the language, given that a greater percentage of participants reported they were literate in Amharic (55.4%) compared to Afan Oromo (21.5%).

With the exception of a small number of participants in the PSA in Chapter 2, all participants in the studies in Chapters 3, 4 and 5 were male. The decision for focussing on males has been discussed throughout the thesis, however, it could be considered a limitation of this work. Women do undoubtedly spend a significant amount of time involved in rural agricultural production, using and caring for working donkeys. Whilst we can be reassured that previous studies have shown men to be involved as key decision makers in households, we cannot validate that the information provided to them in these studies has been transferred to women members of the family. Another limitation of this thesis is in the generalisation of the results to women. One study in Ethiopia found that 50% of women in rural areas did not have access to either formal or informal education compared to 39% of men, and that only 19% of women had attended any formal schooling compared to 38% of men (Tesfaye et al., 2005). Women may choose to seek information from other sources (e.g. women's groups), and the transfer of knowledge will be affected by those variables that differ from men (e.g. educational level).

All data gathered during the studies in Chapters 3, 4 and 5 were through questionnaire interviews with participants in either of the two local languages (Amharic or Afan Oromo). The accuracy of the data must be considered carefully with regards to its reliability and validity. The data collected was not validated by observation of actual owner behaviours, and may therefore be both imperfect and biased due to participants reporting of perceived correct answers. However, due to the study design utilised in Chapters 4 and 5 (cluster-randomised controlled trial), we would expect bias and measurement error to be randomised across all participants, in all intervention groups and therefore have minimal effect on the estimates of the effects of the interventions. Blinding would have assisted in preventing bias in study measurement, However it was impractical to blind the trial leader and administrator due to study constraints. The questionnaire was designed to remove ambiguity with regards to correct and incorrect answers.

In a number of the studies in this thesis there was the potential for selection bias. In the indivdual questionnaires and the PSA, villages and the owners selected were deemed to be representative of other rural villages and working donkey owners in the region. However, no random sampling process was utilised to select either the villages or owners in these studies, and owners who volunteered to participate in these studies may differ in some way from those who did not want to participate. Both of these issues could potential lead to the villages and owners being a non representative sample of the intended target population. In the cross-sectional study and the randomised controlled trial, both villages and owners (rural donkey owners) were randomly selected and therefore should be representative of other rural donkey owners in this region of Ethiopia. Ethiopia is a vast country with differing climatic, topographical and socio-cultural differences between regions, and these studies were all conducted in the central region, therefore, the conclusions may not be applicable to other regions. All three studies involved rural donkey owners and therefore the results may not be generalisable to owners of other working equid species in other locations (e.g. working horse owners who live in urban and peri-urban locations).

It is worth noting that this study only intended to evaluate and quantify knowledge change. No attempt was made to directly measure (quantitatively) behavioural change in the trial participants. Changes in attitudes and behaviour were indirectly assessed and explored qualitatively. Qualitative information collected identified a positive attitudinal response in participants towards the education programme (94% responding that the intervention was very good or good), and an intention to change behaviour or reported behaviour change (with 93% reporting they have changed their donkey's baselayer since the education). However this information was not validated in this study although this would be an obvious further step (given funding and resources) as studies have shown that effective interventions can lead to behavioural changes (Ngowi, 2011; Grace et al., 2008).

The use of a mixed methods approach throughout this thesis (using both quantitative and qualitative approaches) was essential for achieving the study objectives. The participatory approaches used in this study have particular strengths, namely, their ability to generate locally specific information that has local validity (Catley et al., 2012), and allow in-depth discussions that provide a better opportunity for understanding owners' concerns and perceptions (Upjohn et al., 2012). When this information is combined with more classical quantitative approaches (the cross-sectional study and the randomised controlled trial),

both of which allow more direct objective measurement, the end result is a more detailed assessment of the situation and the effect of potential interventions.

Working equids (horses, mules and donkeys) are afflicted by numerous disease and health constraints that affect their health, welfare and productivity (Pritchard et al., 2005; Tesfaye and Curran, 2005). They are intrinsically linked to the livelihoods of rural Ethiopian villagers, the majority of whom derive a living and income from smallholder farming and subsistence agriculture (Admassu and Shiferaw, 2011; Pritchard, 2010). Despite this, working equids are routinely missed off the agricultural, educational and developmental agendas. Donkeys are considered by many as having the lowest status of all the animals owned (FAO and Brooke, 2011; Marshall and Ali, 1997), below that of cattle (which can provide meat, milk, draught power and social capital), below goats and sheep, even below backyard village poultry. During the studies presented in this thesis it became apparent that within rural Ethiopian communities this was still the situation in many cases. This low status potentially impacts on healthcare provision for donkeys, with one study by Marshall and Ali, (1997) reporting that farmers shared a common perspective that donkeys received very little care, and that if there were health problems, traditional medicine was often used. The study also reported that that the farmers' attitudes to donkey health were that treating donkeys for disease was difficult, as they tended to die when they get sick. Further research is warranted to understand the sociological aspects behind their low status within Ethiopian society.

The findings from these studies have influenced further initiatives with working equid owners in Ethiopia. The results from the RCT informed an extension programme involving 100 rural villages and 3385 donkey owners in central Ethiopia. The programme utilised a combination of both a village meeting and a handout to transfer knowledge about wounds and wound management in donkeys. A similar RCT was carried out with urban cart-horse owners evaluating the efficacy of two knowledge-transfer interventions (handout and village meeting) at transferring information about Epizootic Lymphangitis (Stringer et al., 2010). Subsequent to the completion of this RCT, a more widespread extension programme involving the dissemination of approximately 5000 handouts to cart-horses owners across seven towns was completed.

Ethiopia, with its large population of working equids, is ideally placed to benefit from appropriate education or extension programmes for the owners and users of equids. The

results from this study may be beneficial to other populations of livestock owners, particularly in sub-Saharan Africa. However, it is likely that different issues associated with learning across different communities may exist, and these must be carefully considered, and preferably identified using participatory methodologies when designing education programmes. Further randomised controlled trials testing the effects of extension interventions on knowledge and behaviour change with regard to animals' health would be beneficial to corroborate the effect found in this study and explore differences in different populations.

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APPENDIX

Participatory Situation Analysis.

Part 1: Health and Disease. (GROUP).

- **QUESTION:** What are the common diseases and health concerns that affect your horses and donkeys?

  TASK: Open discussion and listing.

- **QUESTION:** How common are these conditions?

  TASK: Ranking.

- **QUESTION:** How long do these conditions affect your horse, mules or donkeys ability to work?

  TASK: Matrix.

- **QUESTION:** Do these problems affect your job, income and lifestyle?

  TASK: Open discussion.

- **QUESTION:** What are the clinical signs associated with these diseases and what are the treatment options

  TASK: Open discussion.

Participatory Situation Analysis

Part 2: Contact/Knowledge Networks. (GROUP).

- **QUESTION:** Where do you get information/knowledge about horse and donkey health and welfare from?

  TASK: Listing and Matrix.

- **QUESTION:** How regularly do you receive advice/information? (daily/weekly/monthly)

  TASK: Matrix.

- **QUESTION:** How is this information/advice given to you - Verbal/meetings/handouts?

- **QUESTION:** Is there a common meeting place?

- **QUESTION:** How reliable or correct is this information/advice?

- **QUESTION:** Do you freely give this information/advice to others?

Participatory Situation Analysis

Part 3: Contact/Knowledge Networks. (INDIVIDUAL)

- **QUESTION:** Which people do you talk to most often in the village/town/community about horse/mule/donkey issues?

- **QUESTION:** Do these people own horses/mules or donkeys?

- **QUESTION:** How long have you known them?

- **QUESTION:** Are you related to them? (Family/friend/neighbour/co - worker)

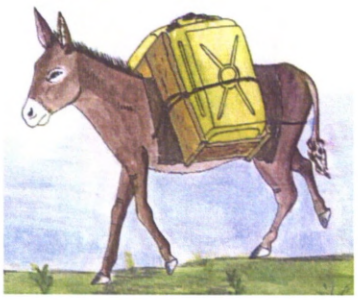
- **QUESTION:** Who is involved in the day-to-day care of your horse/mule/donkey? (feeding/water/healthcare/work?).

- **QUESTION:** How often do you talk about horse/mule/donkey issue with them? (Daily/weekly/monthly)

- **QUESTION:** Do you give information/advice to people?

- **QUESTION:** Do people come to you for information/advice?

Working Equids Education Project



NETWORK QUESTIONNAIRE

ID:

Date:

Village:

1. What is your name?

Sources	2. Of the following people/places, who do you go to for advice about donkeys?	3. With what time interval you have discussed with those people/places? (d,w,i,o)	4. The advice you get from these people/places is reliable/better?
Family/Elders	☐	d, w, i, o	Yes / No
Friends/NB's	☐	d, w, i, o	Yes / No
Agri. office	☐	d, w, i, o	Yes / No
PA/Kebele As.	☐	d, w, i, o	Yes / No
Trad. Person	☐	d, w, i, o	Yes / No
Other	☐	d, w, i, o	Yes / No

5: Who is the most knowledgeable person about donkeys in your village?

6: Do you give advice about donkeys for other people without their asking?

Yes / No

7: Do other people come to you to get advice about donkeys by their own initiative?

Yes / No

	8. Which of the following task would you perform?	9. Do people in your village do like you?
Washing wounds	☐	☐
Cleaning wounds	☐	☐
Healing wounds	☐	☐

10. Upto what grade you learnt?

Not educated		Junior	
Adult Education		Higher	
Primary		Other:	

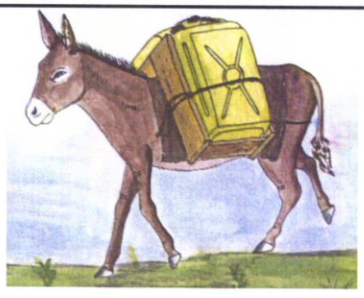
11. Could you listen to radio programme at the evening and at the morning?

Yes / No

12. Can you read?

Oromic	
Amharic	

Working Equids Education Project



NETWORK QUESTIONNAIRE

Ganda:

Guyyaa:

ID:

1. Maqaan kee eenyuu?

Eddoo/Nama	2. Namoota/bakkeee armaan gadii keessaa eddoon gorsa waa'ee harree argachuuf dhaqxan eessa?	3.Yeroo hangamiitiin jara wajjiin mari' attu? (Guyyaadhaan, Torbaaniin , Darbee darbee, kan biraa)	4.Gorsi jara kana irraa argattan dhugaadhaa, gaaridhaa?
Maatii/abbootii	☐	G T D K	Eeyee/Miti
Hiriyaa/oollaa	☐	G T D K	Eeyee/Miti
M/qonnaa	☐	G T D K	Eeyee/Miti
Ganda	☐	G T D K	Eeyee/Miti
Qoricha Aadaa Nama beeku	☐	G T D K	Eeyee/Miti
Kan biraa	☐	G T D K	Eeyee/Miti

5. Waa'ee harrootaa irratti ogeessi baay'ee beekamaa ta'e ganda keessan keessatti eenyu?

6. Ati namoota birootiif osoo isaan si hin gaafatin gorsa waa'ee harrotaa kennitaa?

Eeyee / Miti

7. Namootni kaka'umsa ofii isaaniitiin waa'ee harrootaa gorsa argachuuf dhufu?

Eeyee / Miti

	8.Hojjiiwan armaan gadii keessaa kan hojjetuu?	9. Namooti ganda kee keessa jiranis akkuma keetii?
Madaa dhiquu	☐	☐
Madaa qulqulleessuu	☐	☐
Madaa fayyisuu	☐	☐

10. Hanga meeqatti barattee?

Hin baranne		Sadarkaa Gidugaleessaa	
Barumsa bu'uraa		Sadarkaa ol'aanaa	
Sadarkaa xiqqaa		Kan biraa:	

11. Sagantaa radiyoo galgalaa fi ganama dhageffachu dandeessuu?

Eeyee / Miti

12. Dubbisuu dandeessuu?

Oromiffa	
Amaariffa	

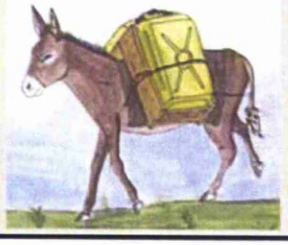
Learning Objectives

Wounds:

1. List 4 causes of manmade wounds.
2. Identify 4 common sites/areas affected by manmade wounds.
3. Be aware of good and bad topical treatments for wounds.
4. Describe how to prepare an appropriate salt solution for cleaning wounds.
5. List the 3 steps involved in cleaning wounds appropriately:
   - Wash hands. Cover with plastic bag.
   - Wash wounds using salt solution.
   - Wash hands and plastic bag.
   - Wash wounds once daily.
6. Recognise 2 signs of an early harness wound
7. Select appropriate material as base layer for harness.
8. Describe 3 important features of the padding on the harness.
9. Describe an important feature of harness base layer care.
10. Recognise 3 disadvantages of your donkey having wounds.

Handout (Afan Oromo Version) Page 1:

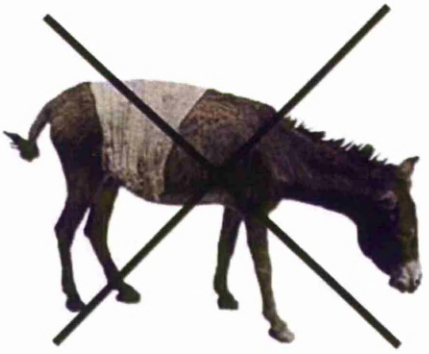
Working Equids Education Project



Harree fayyaan, Harree cimtuudha!

Sababa madaa namaan uumamanii

Humnaa ol-fe'uu



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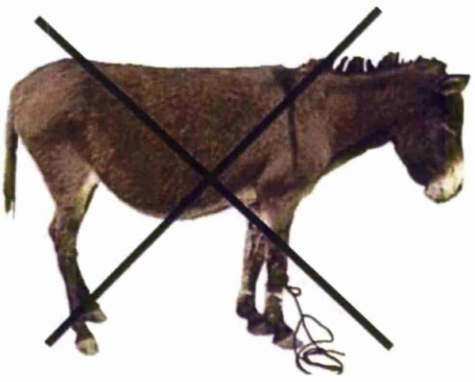

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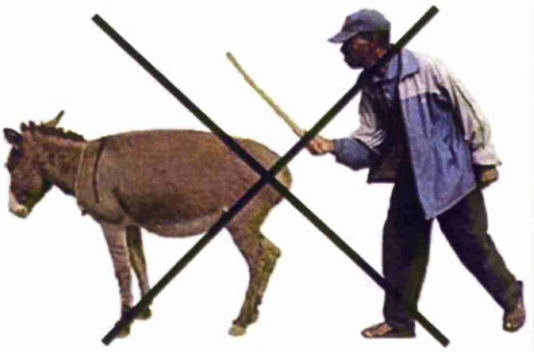

Rukuttaa

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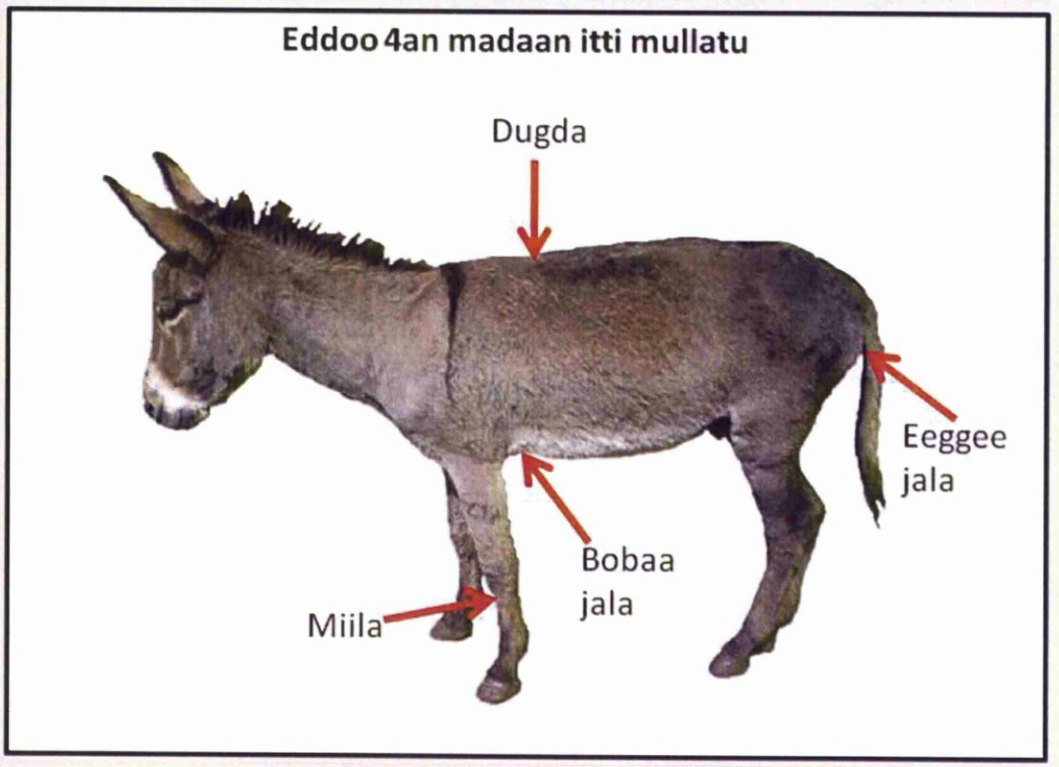
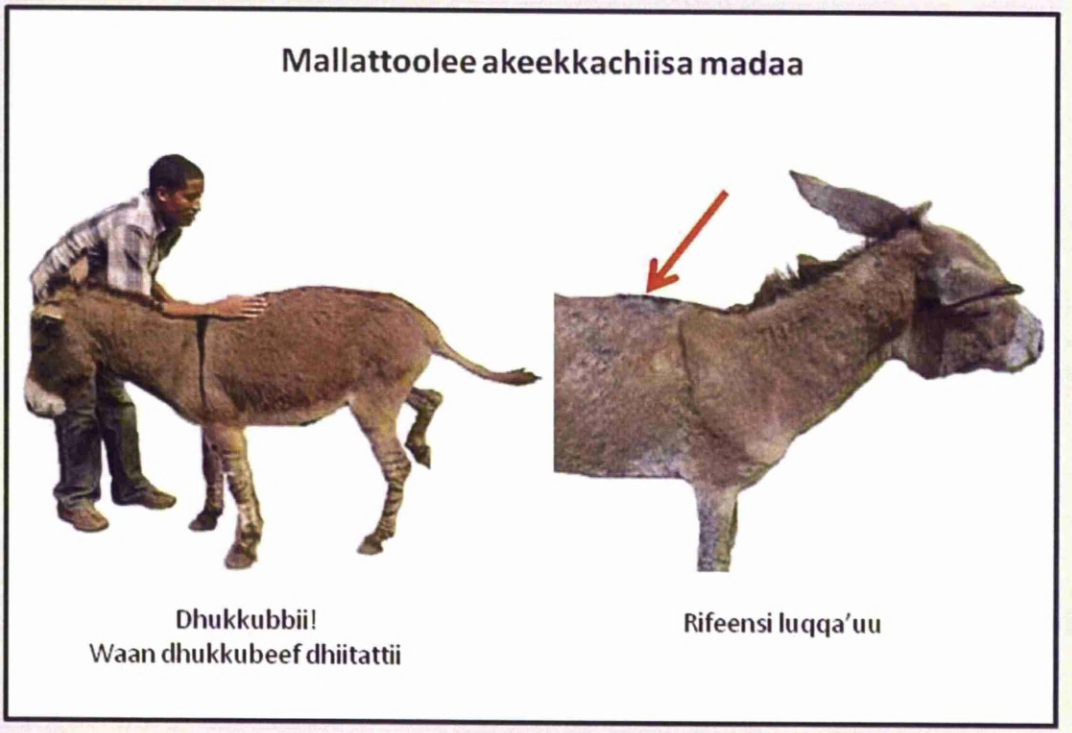
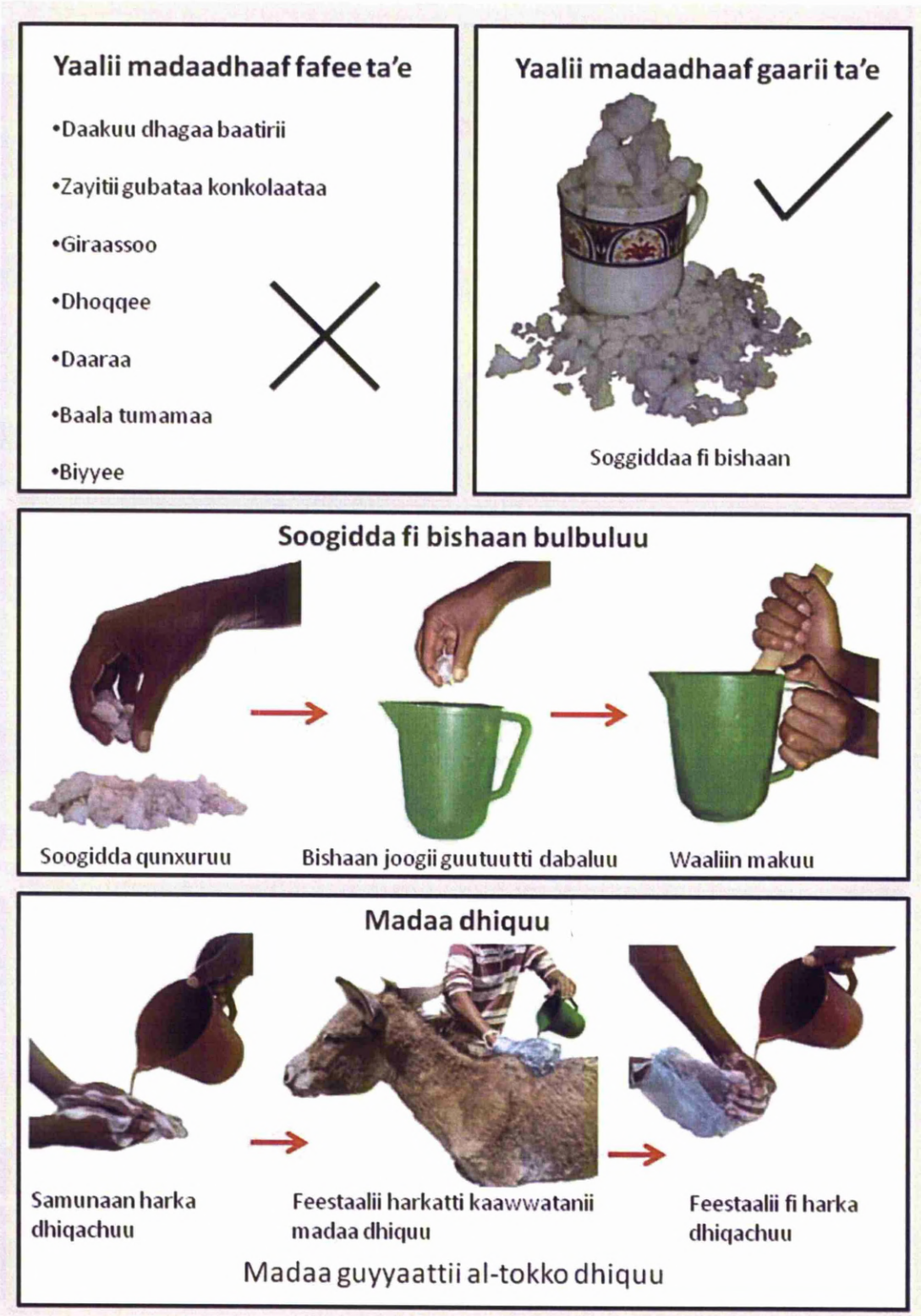

Eddoo 4an madaan itti mullatu
Dugda
Eeggee jala
Bobaa jala
Miila


Mallattoolee akeekkachiisa madaa
Dhukkubbii!
Waan dhukkubeef dhiitattii
Rifeensi luqqa'uu

Page 3:


Yaalii madaadhaaf fafee ta'e
•Daakuu dhagaa baatirii
•Zayitii gubataa konkolaataa
•Giraassoo
•Dhoqqee
•Daaraa
•Baala tumamaa
•Biyyee
Yaalii madaadhaaf gaarii ta'e
Soggiddaa fi bishaan
Soogidda fi bishaan bulbuluu
Soogidda qunxuruu
Bishaan joogii guutuutti dabaluu
Waaliin makuu
Madaa dhiquu
Samunaan harka dhiqachuu
Feestaalii harkatti kaawwatanii madaa dhiquu
Feestaalii fi harka dhiqachuu
Madaa guyyaattii al-tokko dhiquu

Page 4:

Kiskaasii mijeessu

Dugdaa fi cinaa lamaan uwwisuu qaba

Furdina kiskaasii ilaaluu

Dabasha gaarii

- Kafana moofaa
- Gaabii moofaa
- Birdilibsii

Yeroo yeroon qulqulleessu fi miiccuu

Dhiibbaa harroota madaa of-irraa qabdu 3

- Dhibeedhaaf saaxilbahuu
- Umrii gabaabachuu
- Cimina hojii dhabuu

Handout (English Translation) Page 1:

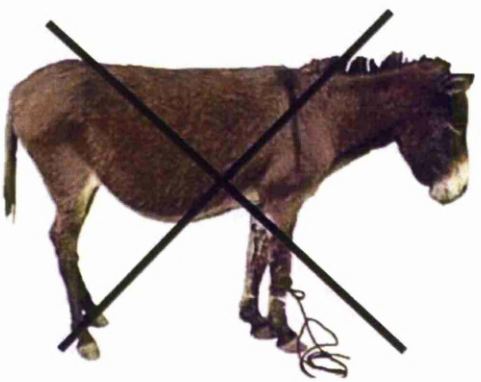
Working Equids Education Project

Healthy donkey is hard working donkey

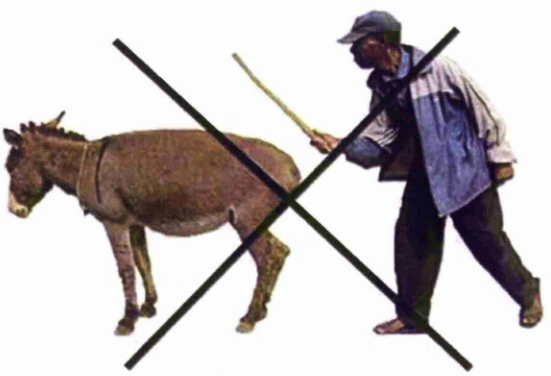
Causes of manmade wounds

Overloading

Bad harness



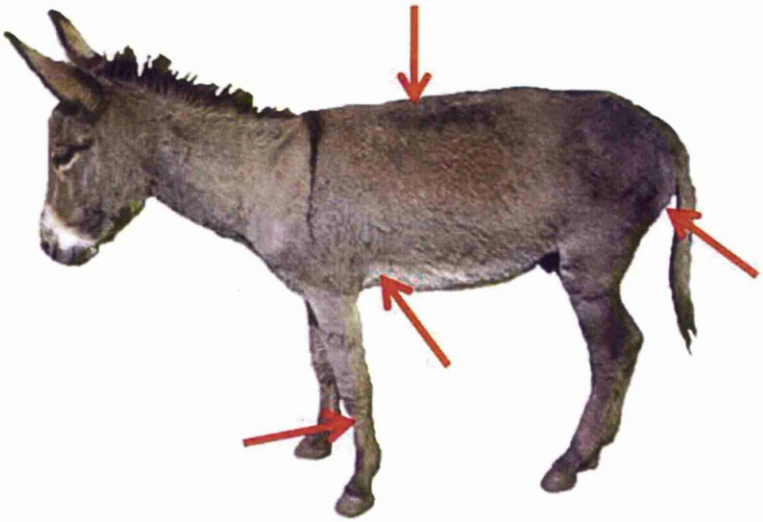
Tying



Beating

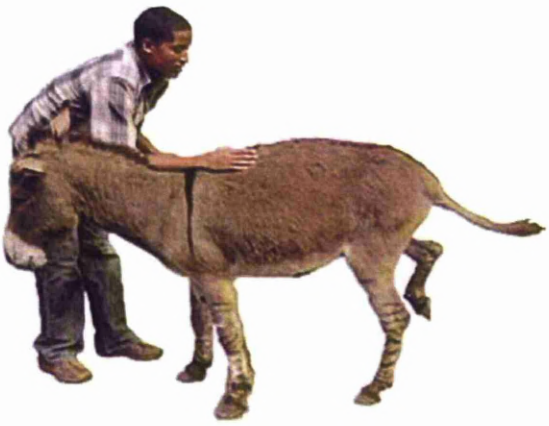
Page 2:

4 common sites of wounds

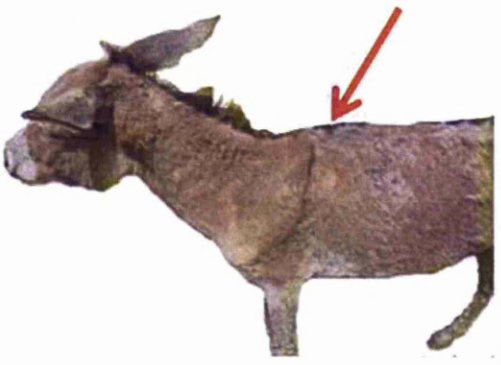


Back, under tail, under arm, leg

Warning signs of wounds



She sense pain she is kicking



Hairloss

Page 3:

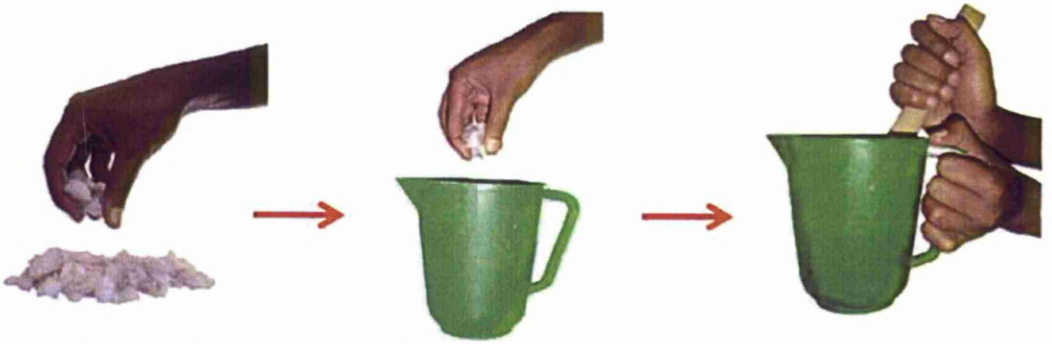
Bad treatments of wounds

- Battery cell powder
- Car oil
- Grease
- Faeces
- Ash
- Crushed leaf
- Soil

Good treatment of wounds

Salt and water

Mixing of salt and water



Pinch of salt | Add to jug full of water | Mixing

Washing a wound

Washing hand with soap | Washing wound with hand covered with plastic bag | Wash hand and plastic bag

Wash wound once daily

Page 4:

Making the harness good

It should cover the back and both sides

Checking of thickness

Good baselayer

- Old clothes
- Old gabbii
- Blanket

Wash and clean it regularly

3 problems of donkey with wounds

- More prone to diseases
- Short lifespan
- Work inefficiently

AUDIO TRANSCRIPT
ENGLISH

Character 1: Tola (T): Young, inexperienced farmer.
Character 2: Abbaa Kabbadaa (AK): Wise, experienced village elder.

T: What happen to my donkey? She is always getting down, what can I do for my donkey? AK donkey has got good body condition. I think she's not working, because she is very fat. How can I care for my donkey? Let me go and ask him for advice. May I get him at home?

AK: Who is that just coming to me, is he Tola? Is he finding me, what will be his problem?

T: Good morning AK.

AK: Good morning Tola, get in please?

T: It is better to be outside, how are you AK?

AK: I am fine. What is your problem? Why are you coming in this cold weather, what can I help you?

T: I have got a problem AK. I just come to you to get good advice for my problem?

AK: What is it, is any of your animal sick?

T: Yes AK.....as you know the harvesting season is coming so that nothing can be done without the help donkeys, it is very difficult. There is a severe problem with my donkey. I don't think she can work that much. Now it is about 4 months, she is just getting down; i don't think she can collect grain from the field. Her back, leg, under arm and under tail, almost all of her body is affected with wounds. What would be the solution AK? You might have advice? You are elder of our community, when I see your donkey is very fat, no wound on her body at all, you do not use your donkey? How do you care for your donkey, would you tell me?

AK: Tola! You know as you have told me, harvesting season is coming. So for this purpose it is very important to use donkey. Here you have to know how to use your donkey. That means if you don't know how to use properly, you may produce wound. For example, if you overload donkey you may produce wound on her back. Specially whatever the load, it is bad habit to load without harness or with harness which is bad. The strap we use for loading and the thin rope we use for tying may

produce wound under the tail, under armpit and on the leg if we leave for a long time. Also beating may produce wound as well.

T: OK AK. How could this produce a wound?

AK: As I have told you, if you load your donkey with bad harness you may cause wound. Because that load may rub the hair and then cause wound at that point. On the other hand, the strap or rope that you use to tie your donkey may cause wound on her leg. Not only this, if you just overload your donkey and beat her you may cause wound. You understand me T?

T: AK, thank you so much! You are very knowledgeable person in our village really. One who has no knowledge might make a mistake. As you have told me before, the wound on my donkey is mostly: on the back, leg, under arm and under tail.

AK: You see Tola, very common sites of wounds on which the load and the skin of donkey is rubbed together. It is also on where the fuel wood or nail punctures the skin, there may be wound. The rope or strap of rough rubber if it is not padded well it may produce wound. You understand me? Up to now, we have discussed about the 4 causes of manmade wounds: these are: overloading, bad harness, beating and tying. Once you harm your donkey, but since now using what I have advised you, you can treat your donkey.

T: Oh AK! You know my problem. I am poor, so how can I treat my donkey.

AK: Tola, just listen to me, till we finish our discussion, I am going to tell you very simple way to treat your donkey at you home without any cost. Tola, there are 2 different types of treatments of wounds. Bad treatment and good treatment, but now I want to tell you about good treatment of wounds. This is mixture of salt and water. You can mix 1 litre of water and one pinch of salt together.

T: How can do AK? I don't have any material to measure one litre?

AK: This is very simple! Don't you have jug at home?

T: Oh.....I have more than 2!

AK: Yes, water full of one jug is one litre. You can prepare mixture of one litre of water with one pinch of salt, then you have to wash your hands with soap and water, then cover your hands with clean plastic bag. Then after wash the wound on donkey using of mixture of salt and water. Finally you have to wash your hands and plastic bag with soap and water.

T: This is very simple for me. I can start immediately after i turn back to home, but can it be healed within short time?

AK: Perhaps, it can be difficult to heal severe wound in short time, so that you have to wash until the wound is healed. Once a day after work time, is it clear T?

T: Yes it is very clear, you say once a day!

AK: Yes!

T: Thank you very much AK. But no medicine better than this?

AK: No any medicine better than this, which can be prepared at home simply. But there are other bad treatments like: grease, car oil, faeces, ash, battery cell powder, crushed leaf and soil. So these are very bad for wound of donkeys to heal.

T: I have been using battery cell powder; do you mean that it is bad AK?

AK: Yes, very bad, it aggravate wound of donkey, then it takes too long to heal. To treat wound of donkey you have to wash using mixture of salt and water.

T: It was my mistake; i was harming my donkey, I think that's why my donkeys wound couldn't be healed

AK: Yes, yes!

T: This wound will be occurred again, even after it will be healed. How can I prevent the wound AK?

AK: Very good question Tola! To prevent wound of donkeys you have to identify pre wound signs.

T: What do you mean AK? Wound is wound? How can be identified? What are the signs?

AK: You see Tola. There may be loss of hair and she may sense pain on the point of wound. When load is rubbed or when fuel wood punctures the skin or when the strap under the arm rubs the skin the wound is likely to occur on that area. On the other hand the harness that you use if it is dirty and rough, it may remove the hair. The donkey may sense pain or run away when you touch the area. As soon as you observe these 2 signs you have to change the harness. You have to make it thicker and the strap must be padded. As much as possible the harness must be cleaned and washed regularly.

T: How can I make it thick AK? I don't have material to make it thick, what can I do?

AK: Oh! This is very simple. Don't you have old blanket, old gabbii and other soft clothes. So you can pad these materials together and use it as a base layer for donkey, but it must be clean and washed regularly.

T: Oh AK! This is very boring! What if we just use inner part of tyre, leather or something else like nylon sack?

AK: No Tola! I told you such materials are very bad. You should not use them as a harness. Specially using material as base layer may remove all the hair then lead to wound. So, you should use those soft materials life old blanket, old gabbii and other soft clothes. In relation to this, you have to assess the comfort ability of harness whether it covers the whole back, both sides of the donkey and it must be thick.

T: Ok, you mean that the harness must protect the back and both sides and must be thick?

AK: Yes! I think you understand, you got the point of our discussion.

T: Yes! It is clear, about 4 main causes of manmade wounds, how to treat wounds and how to prevent wounds.

AK: Tola my son! You are very clever. Finally what you have to bear in mind is that the effect of what all we have discussed till now on donkeys. Donkeys with severe wound maybe more prone to different diseases, so that she couldn't work efficiently like other healthy donkeys. Otherwise she may die earlier. We can take your donkey as an example, so you should care and treat your donkey very well.

T: AK! Really I got a lot of knowledge from you today, thank you so much. I hope here after my donkey may not be prone to different diseases, she can live long and working efficiently.

AK: Well, if you change what I advised you till now, into practice, I hope you could treat your donkey well.

T: Thank you so much AK, may God live you long.

AK: Please, why don't you get in Tola?

T: No, it is fine! Let me back to home and start to treat my donkey, have a good day AK.

AK: Have a good day Tola!

AUDIO TRANSCRIPT
OROMIC FINAL

Fakkessaa 1: Tolaa (T)
Fakkessaa 2: Abbaa Kabbadaa (AK)

T: Hareen tiyya tuni maaluma taatee laata? Baay'ee gadi deemaa jirti. Maaluma godhuufii naa wayyaa? Hareen Abbaa kabbadaa takkallee nafa gaarii qabdii siruma waan hajjettayyuu hinfakkaattu, baay'ee furdoodha. Mee maaluma godheefii akka furdiseen gaafahdaa, manatti argadha laata?

AK: Eenyuu suni kan gara koo dhufaa jiru? Tolaa dhayi! Ana barbaadaayi maal rakkatinna laata?

T: Akkam bultan Ak!!

AK: Akkam bulte Tolaa ol-seeni!

T: Aluma kana naawayya, akkam isin AK.

AK: Ani fayyaadha--- maali Tolaa koo qorra kanaa naguma dhuftee?

T: Nan rakkadhe AK, mee yoo mala gaarii qabaattan ta'e jedheetin isiniin mari'achuu dhufte

AK: Maali inni Tolaa--- horiitu faara sijalaa dhabemoo?

T: Eyyee AK--- akkuma beektan yeroon makaraa kuni gahaajira, kanaammo harree malee waan tokkoyyuu hojjechuun hin danda'amu, baay'ee rakkisaadha. Harreen tiyya takkaammoo rakkina guddaa qabdi, Hagas mara waan naaf hojjetuyyuu hin fakkaattu. Amma kunoo gara ji'a 4 ta'ee..... gaduma deemti! Guuraa kana waan dandeessuyyuu hinfakkaatu. Dugdi ishii, bobaa jala, eegee jala, miila ishii..... walumaagalatti nafti ishii marti madaa'ee jira. Mee maaluma malli AK isin mala hindhabdani? baay'ee nama guddaa waan taataniif. Harreen keessan ammo baay'ee furdoodha, madaa tokkollee hin qabdu. Sila itti hinfayyadamtan moo, haala kamiin kunuunsitan harree teessan, mee natti himaa?

AK: Tolaa,.... maal sitti fakkaate, akkuma dura natti himte, makarri gahaa jira. Kanaaf ammoo harreen fayyadamuu baay'ee barbaachisaadha. Asitti haala kamiin akka fayyadamnu beekuu qabna. Kana jechuun haala fayyadamtuun yoo hin beekne ta'e madeessuu dandeessa. Fakkeenyaaf humnaa-ol yoo feete dugdi ishee madaa'uu danda'a. Keessayyuu fe'iisa kamiiyyuu haa ta'uu kiskaasi malee yookii kiskaasi fafeedhaan fe'uun badaadha. Fe'umaan fe'iisa fi tushaan qal'oon miila ittiin hiinu miilarra yoo ture miila, eegee fi bobaa jala madeessuu danda'a, akkasuma rukkuttaanis nimadeessa.

T: Tole AK kuni haala kamiin madaa uumuu danda'a?

AK: Akkuman sitti hime, harree kee kiskaasii fafee yoo feete ni madaa'a, kunis kan ta'u ba'aan suni yoo rifeensa luqqise eddoo sana madeessuu danda'a. gama birootiin, tushaa yookiin fe'umaan harreen hidhuuf itti fayyadamnuu miila madeessuu danda'a, kana qofa miti harree kee humnaa-ol yoo kan feetu ta'e fi rukkutta ta'e madeessuu dandeessa. Walii gallee Tolaa?

T: AK, baay'een isin galateeffadha, isin naannoo kanatti nama baay'ee beekumsa qabu dhugumattii. Namni beekumsa hin qabne ni ballessa. Akkuma dura natti himtan harree tiyyas eddoowwan baay'inaan madaan irratti mul'atu; dugda ishii, miila, bobaa jalaa fi eegee jala.

AK: Argitee Tolaa,.....eddoo madaan itti baay'atu, eddoo fe'iinsi fi nafti harree itti walriguu irratti. Akkasumas qoraan yookii mismaariin nafa waraanee madeessuu danda'a. Fe'umaan tushaa yookiin gommaa jabaan yoo itti maramuu dhabe madeessuu danda'a. Walii galle? Hanga ammaa waa'ee sababoota 4an madaa namaan uumaman, isaanis: humnaa-ol fe'uu, kiskaasii fafee, rukuttaa fi hidhaa ta'uu isaa dubbanneerraa. Harree tee takkaa miitee jirtaa, ammaan booda garuu kan sigorse kanatti fayyadamuun yaaluu dandeessa.

T:Ayi AK....! rakkina koo ni beektani miti? Ani baay'ee hiyyeessa, haala kamiinin yaaluu danda'aa harree tana?

AK: Tolaa!.... , hanga marii keenya fixannuutti cal-jedhii nadhageeffadhu. Harree tee haala salphaadhaan baasii tokko malee manumattii akka yaaltu sitti himuuf; Tolaa!... yaaliin madaa adda addaa 2 tu jira. Yaalii gaarii fi yaalii fafee;amma garuu waa'ee yaalii gaariitin sitti hima., kunis makaa bishaani fi soogiddaati. Soogidda qunxura 1fi bishaan leetira 1walitti makuu dandeessa.

T: Akkamin godha AK? meeshaan leetira 1 ittiin safaru hin qabu.

AK: Kuni baay'ee salphaadha, joogii manaa hin qabduu?

T: Ohhhh.....,lamaa ol

AK: Eyyee....., bishaan joogii guutuu leetira 1. soogidda yeroo1qunxurtee bishaan leetira 1itti maktee qopheessita, sana booda harka kee bishaani fi saamunaadhaan dhiqachuu qabda. Achii harka kee feestaalii qulqulluudhaan uwwisuu, sana booda soogidda fi bishaaniin bulbulame sanaan madaa harree sanaa dhiquu qabda. Dhumarratti harka kee fi feestaalii saamunaadhaan dhiquu qabda.

T: Kuni anaaf baay'ee salphaadha, akkuma mana gaheen jalqaba. Garuu yeroo gabaabaa keessatti fayyuu danda'aa?

AK: Yeroo gabaabaa keessatti madaa cimaa fayyisuun hin danda'amu ta'a. Kanaafuu hanga madaan fayyuuttii sa'aa hojiitiin booda guyyaatti al-tokko dhiquu qabda. Ifa ta'ee Tolaa?

T: Eyyee!.....baay'ee ifa, guyyaatti al-tokko jettanii?

AK: Eyyee.....!

T: Baay'een isin galateeffadha AK! Garuu qorichi kana caalu hin jiruu?

AK: Yaaliin kana caalu kan manatti qophaa'u hin jiru, Garuu yaaliin badaa ta'an jiruu;kan akka daakkuu dhagaa baatirii, giraassoo, dhoqqee, zayitii gubataa daaraa fii biyyee baala tumamaa fa'a. Kunniin garuu madaa harree hin fayyisan.

T: Ani dhagaa baatiriitiin fayyadamaa turee bari!... badaadha jechaa jirtuu AK!!

AK: Eyyee baay'ee fafee dha, madaa harree itti abaasisa, fayyuuf yeroo dheeraa tursiisa. kanaafuu madaa harree yaaludhaaf sooggidda bulbulame fayyadamtee dhiquu qabda.

T: Balleessaan kan kooti, harree tiyya anumatu miidhe, kanaafuu fayyuu dhabde fakkaati

AK: Eyyee.....!! Eyyee.....!!!

T: Madaan kuni yoo fayyee boodallee deebi'ee madaa'uu danda'aa akkamittin irraa ittisuu danda'aa AK?

AK: Gaafii gaaridha Tolaa. madaa harree irraa ittisuudhaaf madaadhaan dura mallattoolee mullatan beekuu qabda.

T: Maal jechuu keessani AK!...? madaan maduma akkamiiniin addaan baasa, mallattooleen isaa maali?

AK: Argitee Tolaa.....rifeensi irraa luqqa'uu danda'a, eddoo madaan bahuu sanattii ammoo dhukkubbiin itti dhaga'amuu danda'a. Ba'aan yoo rige yookii qoraan yoo nafa waraane, yookii fe'umaan yoo bobaa jala rige eddoo sanarra madaa'uu danda'a. gama birootiin meeshaan kiskaasiif fayyadamtu xuraa'aa fi jabaa yoo ta'e rifeensa luqqisuu danda'a, harreeni yoo tuqan dhukkubsachuu fi fiiguu dandeessi. Mallattoolee lamaan kana akkuma hubatteen kiskaasi jijjiiru furdisuu fi qabda, wuddellaanis itti maramuu qaba. Hanga danda'amaa ta'etti kiskaasiin suni qulqulluu fi yeroo hundaa kan dhiqamu ta'uu qaba.

T: Akkamittiin furdisa AK meeshaalee hin qabu maal wayya?

AK: Ayi kuni baay'ee salphaadha bar; wayyaa moofaa akka birdilibsii, gaabii fi wayyaa lallaafaa hin qabduu? Kanneen walitti suphitee akka dabasha harreettii fayyadamuu dandeessa. Garuu yeroo yeroodhaan dhiquu fi qulqulleessuu qabda.

T: Wuu!!!.....AK kuni nama dadhabsiisaa bar !! laastikii qarbataa, gogaa yookii waan akka laastikii madaabaraatti yoo fayyadame maali?

AK: Lakki Tolaa!!! ....meeshaaleen kun badaa akka ta'an sittii himeera, meeshaaleen akkasii kiskaasiif keessayyuu akka dabashaatti fayyadamta taanan rifeensa irraa luqqisee madeessa. kanaafuu meeshaalee lallaafaa ta'an kan akka gaabii moofaa birdilibsii moofaafi wayyaa moofaatti fayyadamu qabda. Kanaan walqabatee mijaa'ina kiskaasiis; dugdaa fi cinaa lamaan harree akkasumas furdaa ta'uu isaa akka gaaritti hubachuu qabda. Furdaa ta'uu qaba.

T: To....le!! kiskaasin kuni dugdaa fi cinaa lamaan akka garitti irraa ittisuu, akkasumas furdaa ta'u qaba jettanii?

AK: Eyyee!! akka gaaritti sii galeera fakkata. Qabxii marii keenyaa argatterta.

T: Eyyee!! baay'ee ifa ta'eera waa'ee sababoota 4an madaa namaan uumamanii akkamitti akka yaalan fi ittisan naaf galeera.

AK: Ilma koo Tolaa! ati gamnadha bari. Dhumarratti kan sammuutti qabachuu qabdu kan hanga ammaa mari'annee kuni rakkina maal harreerraan gaha jennee ilaalla. Harreen

madaa cimaa of-irraa qabdu dhibee birootii saaxilamti, hojjiillee akka harree fayyaatti ciminaan hojjechuu hindandeessu. Waakaanii daftee du'uu dandeessi. Harree kee akka fakkeenyaatti fudhatu dandeenya, kunuunsu fi akka gaaritti yaaluu qabda.

T: Ak....!!! dhugumatti beekumsa hedduu isinirraa argadhe har'aa. Baay'ee isin galateefadha. Ammaan booda harreen tiyya dhibeef osoo hin saaxilamin ciminaan naaf hojjechaa yeroo dheeraa akka jiraattu abdiin qaba.

AK: Mishaa!!! wanta hanga ammaa sigorse kana hojitti yoo jijjiirte harreetee haala gaariidhaan yaaluu dandeessa jedheen abdadha.

T: Baay'een isin galateeffadha AK. Rabbi umrii keessan yaa dheressu.

AK: Maaloo, maaliif ol hinseenne Tolaa?

T:Lakki...yaa ta'u gara manaa deebi'een harree tiyya yaaluu jalqabaa, nagaan oolaa AK

AK: Nagaan ooli Tolaa.

VM TRANSCRIPT

ENGLISH

Presentation:

By the end of this education you have to know more about wound of donkeys and about the following as well:

1. Tell us 4 causes of manmade wound of donkeys.
2. Identify the 4 common sites affected by manmade wounds.
3. Be aware of good and bad treatment for wounds.
4. Describe how to mix salt and water correctly for washing wounds.
5. Tell us the 4 steps involved in washing wounds appropriately:

   Wash hands with soap, cover with plastic bag.

   Wash wound using mixture of salt and water.

   Wash hand and plastic bag with soap

   Wash wounds once daily.
6. Tell us 2 signs of an early harness wound.
7. Select good material as baselayer of harness for donkey.
8. Describe 3 important features about "comfortablity" of the harness.
9. Describe an important feature for care of baselayer.
10. Tell us 3 problems of donkeys having wounds.

In rural areas we have no modern means of transportation, so we are forced to use our donkeys. In day to day work we may unknowingly produce wound on donkeys. There are 2 different types of wounds: accidental wounds and manmade wounds. Today we are going to focus on education about manmade wounds on donkeys: these are wounds that occurred due to you. There are 4 main causes of manmade wounds: Bad harness, overloading, beating and "tying".

PICTURE (4): CAUSES OF MANMADE WOUNDS.

Bad harness is the harness which you use improperly and made up of bad material and which is not balanced. Overloading your donkey with heavy load can produce wound. Tying donkey to prevent movement can cause wounds on the leg. Using rough and very tight ropes and straps for tying donkey and leaving ropes and straps on donkey for a long time can also cause wounds on their leg. Finally beating your donkey to keep walking faster may produce wound.

We commonly find manmade wounds on specific sites on the body of the donkey. The most common sites we observe wounds are: on the back, under the tail, under the armpit and on the leg.

PICTURE (1): PROFILE OF DONKEY WITH 4 WOUND SITES IDENTIFIED.

We often find wounds on the backs of donkeys due to bad harnesses with poor padding and due to overloading. Usually the wound is caused by gradual rubbing of the skin and load at the point where there is heavy load from the harness. Sharp material such as fuel wood and nails can also cause wounds without good padding.

The wounds under the tail are caused by the different types of rump straps that you use for loading donkeys. The rough nylon rope and the rubber straps are bad and can cause wounds, if they are without padding. Wounds on the lower leg are caused by these nylon ropes and rubber straps – when they are attached too tightly, for long time or the rope is too thin. These straps also cause wounds under the armpit. Beating your donkey will also produce wounds. As a result these are the common sites of wounds: on the back, under the tail, under the armpit and on the leg.

Once the wound has occurred it needs treatment to heal and be cured. There are 2 different types of treatments: "good" treatment and "bad" treatments.

The good way to treat a wound is mixture of salt and water. You should prepare mixture of salt and water – Mix 1 pinch of salt in 1 litre of water. 1 litre of water can be measured using the jugs that you all have in your house.

DEMO: SALT AND WATER PREPARATION.

After you have prepared the mixture of salt and water you must wash your hands with soap and water to clean. Next you may cover your hand with a clean plastic bag. You must do these things before you wash the wounds of donkeys. Then you should wash the wound with the mixture of salt and water. Then after wash the plastic bag and your hands again with soap and water. This is the good way to treat wounds on a donkey. You must wash the wounds once a day after work until it heals.

DEMO: WASH HANDS, WOUNDS AND THEN HANDS/PLASTIC BAG.

There are many bad treatments that people have used on wounds of donkeys. These will not help the wound heal and will aggravate the wound. Bad treatments are: car oil, grease, battery cell powder, faeces, crushed leaf, soil and ash. These will make the wound take longer to heal and make it cracked – do not use these things on the wounds of donkeys.

DEMO: BAD TOPICAL TREATMENTS

To prevent wounds on donkey you must know early wound signs observed before a wound is occurred. The 2 signs that you will observe before a wound: hair loss and pain. These are the 2 signs that you will observe. If you see hair loss and observe pain when you touch the area you must use soft and thick harness to prevent a wound. Bad harness and overloading cause hair loss and pain before a wound.

We have told you about the causes and sites of wounds on a donkey. We have also explained about the early signs before a wound and how to treat wounds correctly. Now we will tell you how to prevent a wound.

To prevent the wound on donkey you need to have a good harness with good padding. The harness should be soft and clean. Good materials to use are old blankets, old gabbii and old soft clothes. These materials must be clean and washed regularly.

Bad things to use as baselayer of donkeys are nylon sack, inner part of tyre, dirty material and the rough skin of animals.

You should use the correct material as the baselayer of donkeys, wash it regularly and keep it clean.

You should also observe and check 3 things about the padding of the harness.

PICTURE (2): HARNESS ASSESSMENT.

It should cover the length of the donkeys back, it should cover the side of the donkey and it should be thick and soft. These are the 3 things that you should observe before loading a donkey.

We have told you how to prevent wounds before it occurs on donkey. But we will now tell you why:

Donkeys that have wounds are more prone to suffer from diseases and other problems. They will have a shorter life span because of these wounds and diseases, live for a shorter time and they will not be able to work as hard or efficient as donkeys with no wounds. These are the problems of donkeys that has wounds:

More prone to disease, shorter life span and less efficient work.

We hope that you have enjoyed this presentation and that you have learnt lots about wounds on donkeys. We hope now you can treat wounds, prevent wounds and help to keep your donkey healthy.

Thank you for your time and for listening to this education presentation. Does anyone have any questions.....?

VM TRANSCRIPT

OROMO

Barumsa

Dhuma barumsa kanaa irratti waa'ee madaa harrootaa, akkasuma waa'ee armaangadii akka gaaritti beekuu qabdu.

1. Madaa namni harroota irratti uumuuf sababoota 4 himi.

2. Eddoowwan yeroo baay'ee madaa namaan uumamuun hubaman 4 addaan baafachuu.

3. Waa'ee yaalii fafee fi yaalii gaarii madaadhaaf godhamu hubannoo qabaachuu

4. Madaa dhiquudhaaf soogiddaa fi bishaan akkamitti akka seeraan makamu ibsu.

5. Madaa seeraan dhiquudhaaf tartiiba barbaachisaa ta'an 4 himu

a. Harka saamunaan dhiqachuu fi feestaalidhaan uwwisuu,
b. Soogidda bulbulameen madaa dhiquu,
c. Harkaa fi feestaalii saamunaan dhiqachuu,
d. Madaa guyyaati yeroo tokko dhiquu,

6. Mallattoolee 2aan madaa kiskaasiitiin duratti mul'atan

7. Dabasha kiskaasi harree jala oolu tolchuuf meeshaalee gaarii filachuu,

8. Kiskaasi mijeessuuf haala barbaachisaa ta'an 3 ibsuu

9. Of-eeggannoo dabashaatiif haala barbaachisaa ta'e ibsuu,

10. Rakkoolee harroota madaa of-irraa qaban irra gahu 3 ibsuu.

Naannoo baadiyyaatti tajaajila geejiba ammayaa hin qabnu. Kanaafuu harrootatti fayyadamuun dirqama. Hojii guyyaa guyyaadhaan hojjettan keessatti osoo hin beekin harroota irratti madaa uumuu dandeessu. Madaa adda addaa lamatu jiru: madaa balaati fii madaa harka namaatiin uumamu. Barumsi keenya inni har'aa kan xiyyeeffatu waa'ee madaa harka namaan harroota irratti uumamuu irratti, madaan kun sababa keessaniin kan uumamu jechuudha.

Madaa harka namaatiin uumamaniif sababoota gurguddoo 4 tu jiru: Kiskaasii fafee, humnaa-ol fe'uu rukkuttaa fi hidhaa dha.

PICTURE (4): CAUSES OF MANMADE WOUNDS.

Kiskaasii fafee jechuun kayeroo harreedhaaf fayyadamtan yoo sirriiti fayyadamuu dhabdan, meeshaa fafee irraa yoo hojjetame fi madaalli eeggatuu dhabeedha. Harree kee ba'aa

ulfaataa humnaa-ol yoo feete madeessuu danda'a. Tushaa yookii fe'uma jabaa harree ittiin hidhuudhaaf fayyadamnii fi yeroo dheeraa irra tursiisuun yoo itti jabaate millarratti madaa uumuu danda'a. Akkasumas tushaa yookii gommaa harree takkarratti yeroo dheeraaf dhiisuun madaa uuma. Dhumarratti harreen keessan akka daftee deemtuuf jecha ni rukuttan taanan ni madoofti. Yeroo baay'ee madaa namaan uumaman nafa harraotaa irratti eddoowwan murtaa'aa ta'an irratti argina. Eddoowwan irra caalatti baay'inaan madaa irratti arginus: dugdarra, eegee jala, bobaa jalaa fi miila gara jalaati

PICTURE (1): PROFILE OF DONKEY WITH 4 WOUND SITES IDENTIFIED.

Madaa baay'inaan dugda harroota keenyaa irratti kan arginu kiskaasii fafee, kan sirritti hin dabashamin yoo fayyyadamnee fi humnaa-ol yoo feenedha. Baay'inaan madaan kan uumamu eddoo nafti harree fi ba'aan ulfaatan kiskaasi keessa darbee walrigu irratti; suuta suutaan umamuu danda'a. Akkasuma wanti qara qabu kan akka mismaari fi qoraanii dabasha gaarii hin ta'in yoo fayyadamene madeessuu danda'a, madaan eegee jalaa Wuddeellaa fe'uma adda addaa kan fe'iisaaf fayyadamnu sanaan uumamuu danda'a. Yoo akka gaaritti itti maramuu baate tushaan madaabaraa jabaani fi gommaan, fe'umaa fi tushaa qal'oon miila ittiin hiinu yoo miilarratti jabaate fi yeroo dheeraa irra ture madeessuu danda'a. Fe'umaan kuni bobaa jalattis madaa uumuu danda'a. Akkasuma harree keessan rukuttaanis madeessuu danda'a.

Kanarraa kan ka'e eddoowwan kuni kan madaan itti baay'atu; dugdarra, bobaa jala, eegee jalaa fi miilarra. Madaan takkaa yoo uumamee booda akka fayyu yaalin ni barbaachisa. Yaalii adda addaa 2 tu jira: yaalii fafee fi yaalii gaarii....., madaa makaa bishaani fi soogiddaatiin yaaluun baay'ee gaariidha. Bishaan leetra 1 fi soogidda qunxura 1 walitti bulbultanii qopheessuu qabdu. Bishaan leetra 1 ammoo jogii fayyadamuun safaruu dandeessuu, isammoo hundi keessanuu manaa qabdu.

DEMO: SALT AND WATER PREPARATION.

Soogidda bulbulame erga qopheessitanii booda harka keessan qulqulleessuuf saamunaa fi bishaaniin dhiqachuu qabdu. Sana booda harka keessan feestaalii qulquluudhaan uwwistanii qophaa'uu qabdu. Wantoota kana madaa harroota osoo hin dhiqiniin dura gadhuu qabdu. Sana booda soogida bishaaniin bulbulame sanaan madaa akka gaarritti dhiqu. Dhumarratti feestaali iif, harka keessan irra deebitanii saamunaan dhiqachuu qabdu. Kun madaa harrootaa yaaluf mala baay'ee gaariidha. Madaa kana guyyaatti yeroo tokko sa'aa hojiitiin booda, hanga inni fayyutti dhiquu qabdu.

DEMO: WASH HANDS, WOUNDS AND THEN HANDS/PLASTIC BAG.

Yaaliin fafeen madaa harrootatiif hin taane baay'etu jiru. Isaanis kan namoonni biroo kanaan dura itti fayyadaman jechuudha. Yaaliwwan fafee jedhaman kun; zayitii gubataa, giraassoo, daakuu dhagaa baatirii, dhoqqee, baala tumamaa, daaraa fi biyyee fa'a, kuni madaan harree dafee akka hin fayyinee fi akka dhodhoowu godha...,wantoota kana madaa harrootaatiif akka hin fayyadamne.

DEMO: BAD TOPICAL TREATMENTS

Madaa harroota irraa ittisuudhaaf mallattoolee madaan uumamuun duratti mul'atan beekuu qabdu. Mallattooleen mullatan 2 tu jiru. Isaanis:- rifeensi luqqa'uu fi dhukkubii fa'a. Tuqxanii yoo dhukkubbiin itti dhaga'amee fi rifeensi luqqa'ee argitan dabasha akka gaaritti furdistanii lallaafaa gochuudhaan madaa irraa ittisuu qabdu. Madaadhaan dura dhukkubbiin akka itti dhaga'amuu fii rifeensi luqqa'u kan taasisu ammoo kiskaasii fafee fayyadamuu fi humnaa-ol fe'uudha. Sababoota fi eddoowwan madaan harree irratti baay'atu isinitti himneerra, akkasuma waa'ee mallattoolee madaan uumamuun duratti mul'atanii fi madaa yaaludhaaf mala sirrii ta'e himneerra. Amma ammoo akkamitti akka ittistan isinitti himna. Madaa harroota irraa ittisuudhaaf kiskaasii bayeessa haala gaariidhaan furdate qabaachuu qabdu. Kiskaasiin suni lallaafaa fi qulqulluu ta'uu qaba. Meeshaaleen fayyadamtan bayeessi...., kan akka birdilibsii moofaa, gaabii mofaa, kafana moofaa fa'a. Meeshaalee kunniin qulqulluufi yeroo yeroodhaan kan miiccaman ta'uu qabu.

Dabasha harreetiif meeshaaleen fafee ta'an kan akka laastikii madaabaraa, lastikii qarbataa, gogaa horiiti fi meeshaalee xuraa'aa ta'an fa'a. Dabasha harreetiif meeshaalee sirriidhaan fayyadamuu; yeroo yeroodhaan miiccuu fi qulqulleessuu qabdu. Akkasuma waa'ee mijaa'ina kiskaasiis waa 3 hubattanii ilaaluu qadu.

PICTURE (2): HARNESS ASSESSMENT.

Dugda harree akka gaaritti uwwisuu qaba, cinaa lamaan ishiitis, kiskaasiin suni furdaa fi lallaafaa ta'uu qaba. Harree fe'uun duratti wantoota kana sadeen hubachuu qabdu. Harreerrati madaan osoo hin uumaminiin duratti akkamitti akka ittistan isinitti himeera. Amma garuu kuni hundi maaliif barbaachisee kan jedhu ilaalla. Harreeni madaa of irraa qabdu dhibeedhaaf ni saaxilamti, ni dararamtis. Sababa dhibee madaatiin kan ka'e yeroo tiqqoo lubbuudhaan jiraatti, jechuun umriin ni gabaabata. Akka harroota madaa of-irraa hin qabneetti ciminaan yookiin jabinaan hojjechuu hin dandeessu. Kunniin egaa rakkoolee harroota madaa of-irraa qabdurra ga'u.

Dhibeedhaaf saaxil- bahuu, umrii gabaabachuu fi ciminaan hajjechuu dhabuu.

Barumsa keenya har'aatti akka gammadanii fi waa'ee madaa harrootaa waa heddu akka barattan abdii qabna. Ammaan booda madaa harrootaa akka yaaltani fi fayyaa harroota keessanii akka eegdan abdii qabna. Hanga ammaa nuwajjiin turtanii barumsa kana waan hordoftaniif baay'ee isin galateefanna. Namnii gaafii qabu jiraa....?

Photo 1: Village meeting demonstration with trained animal health worker.

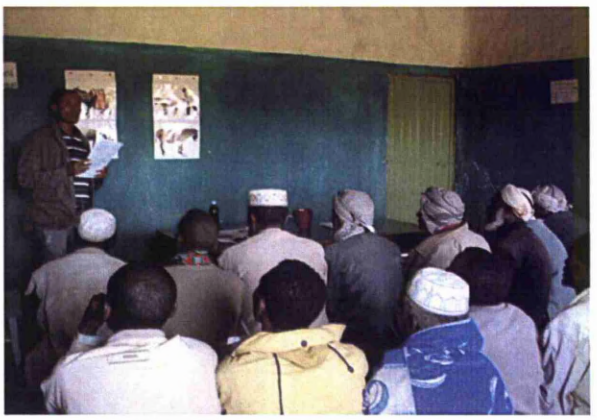
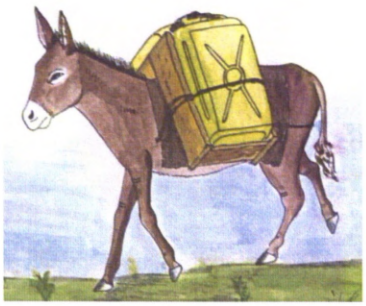


Photo 2: Visual demonstration of traditional bad treatments used on donkey wounds.

Working Equids Education Project



PRE INTERVENTION QUESTIONNAIRE

ID Number:	Name:
Date:	Gender:
DA Name:	Village (Kebele):

Method of education:

C	HO	VM	AO

Section 1: Background Information:

2. How old are you? ____

3. What is your responsibility in the family?

Husband		Son	
Wife		Daughter	
Other			

4. Who is responsible for the problems of donkeys?

Husband		Son	
Wife		Daughter	
Other			

Section 2: General Questions:

5. How many donkeys do you currently have? ____

6. Do you have any other animals?

Cow/Ox		Sheep	
Horse		Goat	
Mule		Dog	
		Poultry	

7. When did you begin using your own donkey?

8. Do you keep your donkey in "mooraa" during the night?

Yes / No

9. Have you taken your donkeys to whom come to your village to treat donkeys or to get education about donkeys?

Yes / No

If yes:

8a. Who were those? What did they do?

Section 3: Wounds:

10. On which body part of the donkey that you are observing manmade wounds most frequently? (*Picture aid*)

11. What are the causes of manmade wounds of donkeys?

12. Tell us two signs observed on donkeys before a wound is occurring?

Section 4: Wound treatment:

13. What care should be taken before you wash the wounds of donkeys?

14. Tell us the best way that you should use to cure the wounds of donkey?

15. Tell us the bad ways that should not be used to treat the wounds of a donkey?

16. To wash wound of donkeys, how much salt and how much water should be mixed?

17. How many times a day you should wash wound of donkeys?

Section 5: Prevention:

18. What type of "baselayer" you have to use for your donkeys?

19. To make the harness good and protect the donkey from the load tell us 3 things you should observe?

20. For the "baselayer" of the donkeys what care should be taken?

21. What are the problems or effects of donkeys with wounds?

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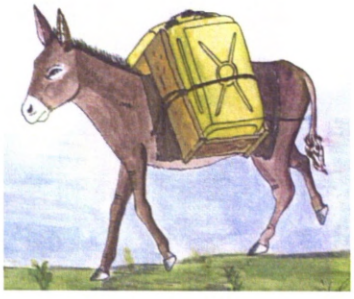

PRE INTERVENTION QUESTIONNAIRE

ID Number:	Maqaa:
Guyyaa:	Saala:
Maqaa DA:	Ganda:

Method of education:

C	HO	VM	A

Section 1: Background Information:

1. Waggaan kee meeqa?

2. Maatii keessaatti gahee kee maali?

A/manaa		ilma	
H/manaa		intala	
Kan biraa			

3. Harree takka yoo rakkinni irra gahe eenyu itti gaafatama?

A/manaa		ilma	
H/manaa		intala	
Kan biraa			

Section 2: General Questions:

4. Yeroo ammaa kana harroota meeqa qabda?

5. Hori biroo hoo qabduu?

Sa'a/Qotiyyoo		Hoolaa	
Farda		Re're	
Gaangee		Saree	
		Lukkuu	

6. Harree ofii keetii yoom irraa jalqabdee itti fayadamuu jalqabde?

7. Mooraa harree kee keessa bulchitu qabdaa?

Eeyee / Miti

8. Kanaan dura warra naannoo keessan dhufee harroota hakimu bira harree hakimsiisuuf ykn barumsa waa'ee harree argachuuf geessitee beektaa?

Eeyee / Miti

Eeyee?

8a. Enyuu isaan? Maal hojjechaa turran?

Section 3: Wounds:

9. Nafa harrootaa irratti eddoo yeroo baay'ee madaan namaan uumamu mul'atu kami? (*Picture aid*)

10. Madaa namni harrootarratti uumuf kan sababa ta'u maal fa'a?

11. Madaan harroota irratti uumamuun duratti mallattoolee mul'atan lama himi?

Section 4: Wound treatment:

12. Madaa harrootaa dhiquun duratti of-eeggannaa godhamuu qabu maali?

13. Madaa harrootaa fayyisuudhaaf mala bayeessa fayyadamuu qabdu himi?

14. Madaa harrootaa fayyisuudhaaf mala fafee ta'e fi kan itti fayyadamuu hin qabne himi?

15. Madaa harrootaa dhiquudhaaf soogida hagami bishaan hagamitti makuu qabdu?

16. Madaa harrootaa guyyaatti yeroo meeqa dhiquu qabdu?

Section 5: Prevention:

17. Dabashni harree teessaniif fayyadamuu qabdan kan akkamiiti?

18. Kiskaasii mijeessufi ba'aa harree irraa dhoowwuf waan hubachuu qabdu sadi himi?

19. Dabasha dugda harreetti aanuuf of-eeggannoon godhamuu qabu mali?

20. Rakkooleen ykn dhiibbaan harroota madaa qabdurra ga'u maali fa'i?

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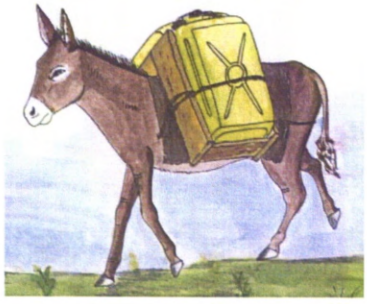


SHORT TERM FOLLOW UP QUESTIONNAIRE

ID Number:	Name:
Date:	Gender:
DA Name:	Village (Kebele):

Method of education:

C	HO	VM	AO

Section 1: Wounds:

1. On which body part of the donkey that you are observing manmade wounds most frequently? (*Picture aid*)

2. What are the causes of manmade wounds of donkeys?

3. Tell us two signs observed on donkeys before a wound is occurring?

Section 2: Wound treatment:

4. What care should be taken before you wash the wounds of donkeys?

5. Tell us the best way that you should use to cure the wounds of donkey?

6. Tell us the bad ways that should not be used to treat the wounds of a donkey?

7. To wash wound of donkeys, how much salt and how much water should be mixed?

8. How many times a day you should wash wound of donkeys?

Section 3: Prevention:

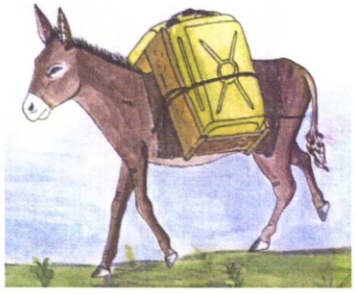
9. What type of "baselayer" you have to use for your donkeys?

10. To make the harness good and protect the donkey from the load tell us 3 things you should observe?

11. For the "baselayer" of the donkeys what care should be taken?

12. What are the problems or effects of donkeys with wounds?

Working Equids Education Project



SHORT TERM FOLLOW UP QUESTIONNAIRE

ID Number:	Maqaa:
Guyyaa:	Saala:
Maqaa DA:	Ganda:

Method of education:

C	HO	VM	A

Section 3: Wounds:

1. Nafa harrootaa irratti eddoo yeroo baay'ee madaan namaan uumamu mul'atu kami? (*Picture aid*)

2. Madaa namni harrootarratti uumuf kan sababa ta'u maal fa'a?

3. Madaan harroota irratti uumamuun duratti mallattoolee mul'atan lama himi?

Section 4: Wound treatment:

4. Madaa harrootaa dhiquun duratti of-eeggannaa godhamuu qabu maali?

5. Madaa harrootaa fayyisuudhaaf mala bayeessa fayyadamuu qabdu himi?

6. Madaa harrootaa fayyisuudhaaf mala fafee ta'e fi kan itti fayyadamuu hin qabne himi?

7. Madaa harrootaa dhiquudhaaf soogida hagami bishaan hagamitti makuu qabdu?

8. Madaa harrootaa guyyaatti yeroo meeqa dhiquu qabdu?

Section 5: Prevention:

9. Dabashni harree teessaniif fayyadamuu qabdan kan akkamiiti?

10. Kiskaasii mijeessufi ba'aa harree irraa dhoowwuf waan hubachuu qabdu sadi himi?

11. Dabasha dugda harreetti aanuuf of-eeggannoon godhamuu qabu mali?

12. Rakkooleen ykn dhiibbaan harroota madaa qabdurra ga'u maali fa'i?

Villages within Arsi zone, Oromia region that were randomly selected for inclusion in the cluster-Randomised Controlled Trial (c-RCT):

Woreda (administrative department) Name	Village Name	Number of participants in RCT
Sire	Koloobaa Biqaa	16
	G/shaashee	17
	Alleluu gasalaa	19
	Gasalaa Caacaa	14
	Uffuraa	19
	Ibsataa	13
	Magacaa	18
	Bororaa Cira'oo	15
Hitosa	Seeroo Ankatoc	18
	Booruu leencaa	17
	Shaaqii shararaa	18
	Haxxee Handoodee	15
	Dawee Guutichaa	16
	Booruu Cilaaloo	13
	Janoo qillisa	13
	Dayya'aa Dabbasoo	16
Tiyo	Burqaa Cilaaloo	16
	kataar q/bulaa	17
	Aboosaraa Alkoo	19
	Dooshaa	16
	Dugdaa Ukoloo	19
	Oddaa Dhawwataa	15
	Haroo Bilaaloo	15
	Goraa Silingoo	17
	Dhankaakaa Qonichaa	15
Degeluna Tijo	Guusha xeenalaa	19
	Buchao Silasie	17
	Ayimura Boladanaa	16
	Fitte ketaaraa	16
	Shaaldo Jigessa	14
	Cafaa gogeessaa	14
	Digaluu qidaamee	14
Total Participants		516

Intervention Introduction

I am Gebre Tefera from AAU and this is Dr Andrew Stringer from foreign country (England). He is a veterinary doctor who is studying about donkey health and welfare.

We are here to help you to care for your donkeys and we will do some teaching about caring for your donkeys.

Donkeys are very important to you. They are your only means of transport for you in this community; they help you in many ways. For example: to carry water to your houses and also to carry goods and grain to and from market.

First we need to ask you some questions about the health of donkeys and to ask you about your knowledge on donkeys. Some of these questions you will not know the answer to – that is fine, just say you do not know. Don't hesitate, there is not any problem, we have an official letter from the government, be relaxed, answer the questions we are going to ask you. I will translate it to both languages there may not be any problem with communication. We will ask you the questions individually and some of you will have to wait for your turn, it will take about 20 mins per person. Please be patient and wait for your turn.

After these questions have finished there will be an education programme for you:

1. I will do an education programme to all of you as a group. Please be patient and wait for this.
2. You will be given a handout once we have finished the questions with you
3. There will be a radio education programme that you will all listen to as a group. Please be patient and wait for this

At the end of todays programme you will get a perdiem. You will get the same perdiem three times - today, then we will return in two weeks time and then after several months. You will also be given an individual ID card to help us identify you and to help us pay you the perdiem. Please keep it safe this and bring it with you each time we come and visit. It is very important.

Thank you for listening. We will now start the questions with the first individual. After you have been asked your questions, please do not talk to those people who are waiting for their turn. This is very important for us! You can speak and wait with those people who have already had their turn.

Thank you.

General Introduction – OROMIC

Akkam bultan.....! Baga nagaan dhuftan.....!

Ani Gabree Tafarraan jedhamaa, kanan Yunivarsiitii Addisaabaa irrayi. Inni Dr. Andy Stringer jedhamaa. Kan dhufe biyya alaa (England) ti dhufee, Doktara Hakimii Horiiti. Waa'ee fayyaa fi kunuunsa harrootaa qorachuudhaaf dhufee.

Amma kan dhufne waa'ee fayyaa fi kunuunsa harroota keessanii irratti barumsa isin gargaaru isitti himuu barbaanneti.

Harrootni isiniif baay'ee barbaachistuudha, naannoo kanattii yeroo hunda kan itti fayyadamtan jechuudha. Gama hedduudhaan isin gargaarti. Fakkeenyaaf bishaan waraabuufi midhaani fi meeshaa manaa gara gabaatti akkasuma gabaadhaa gara manaatti fiduudhaan isin gargaarti.

Duraan dursinee waa'ee fayyaa harrootaa irratti beekumsa isin qabdan laaluuf gaafii isin gaafanna. Gaafiwwan kana keessaa kan deebii hin beekne jiraachuu danda'a. Homaa itti hin cinqaminaa, "deebii isaa hin beeku" jechuu dadeessuu. Homaayyuu hin shakkiinaa , xalayaa seeraa mootummaa irraa Aanaadhaaf waan dhiyyeessineef rakkinni hin jiru. Gaafii isin gaafannuuf deebii dhugaa ta'e deebisuu qabdu. Walii galteedhaaf rakkin hin jiru, kan isin dubbattan isaaf, kan isaa ammo isiniif ani akka gaarittin hiikafi. Gaafii kana tokkoo tokkoon waan isin gaafannuuf warri kuun hanga taraan keessan gahutti obsaan teessanii dabaree keessan eeggattuu jechuudha. Nama tokkoof hanga daqiiqaa 20 tursiisuu waan danda'uuf hanga sanatti obsaan taraa/dabaree/ keessan eeggadhaa hadaraa.

Insert when it is important.

Dhuma sagantaa keenya har'aa irratti durgoon ni kafalamaa, akkasuma fuulduras kanaa wajjiin yeroo 3 iif durgoon ni kafalama. Torban 2 booda fi ji'oota hedduu booda jechuudha.

Eenyummaa keessan addaan baafachuudhaaf waraqaan lakkoofsa eenyummaa isiniif kennama, durgoo kana isinii kafaluudhaafis nugargaara. Hadaraa akka hingatne seeran olkaa'aa, yeroo nuti dhufnu marayyuu fiddanii dhuftu jechuudha. Kuni nuuf baay'ee barbaachisaadha.

Baay'ee isin galateeffanna.....! amma gaafii keenya nama taraa duraa wajjiin jalqabna. Hadaraa warri gafatamtanii baatan warra taraa eeggatuti akka hin haasfne!. Kuni nuuf baay'ee barbaachisaadha. Warri gaafatamtanii baatan garuu walitti haasa'uu dandeessu.

Galatoomaa!

Participant identification card (ID card) utilised in cluster-Randomised Controlled Trial:

Working Equids Education Project

Harree fayyaan, Harree cimtuudha!

ID Number:	V1	V2	V3

Working Equids Education Project Marking Scheme

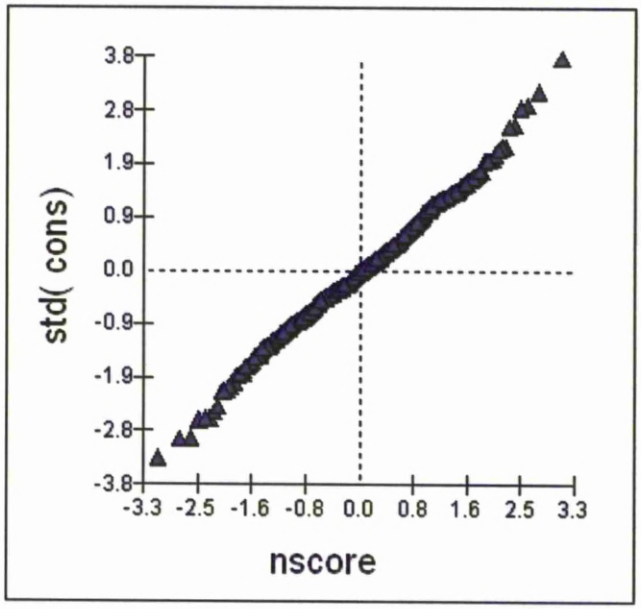
Section	Question	Answer	Score (points per answer)	Total score for question	Question correct? (0,1)
3.1	On which part of the donkey that you are observing wounds frequently? (*Picture aid*)	Back Under tail Under arm Leg	1	4	Need all 4 answers
3.2	Do you know of the circumstances under which a person may create wounds on donkeys?	Improper harness Overloading Beating "Tying"	1	4	Need all 4 answers
3.3	Describe two signs observed on donkeys before a wound is occurring?	Pain Hair loss	1	2	Need all 2 answers
4.1	What care should be taken before you wash the wounds of donkeys?	Wash hands Cover with Plastic bag	1	2	Need all 2 answers
4.2	Describe the best way that you should cure the wounds of donkey?	Wash with salt and water	1	1	Need correct answer
4.3	Describe bad practices that should not be used to treat the wounds of a donkey?	Soil Ash/charcoal Car oil/grease Faeces/manure Battery powder Crushed leaves	0.5	3	Need at least 3 out of 6 answers
4.4	How much is the proportion of salt to water that you should use to wash the wound of a donkey?	1 pinch of salt and 1 jug/litre/kg of water	1	1	Need correct answer
4.5	How many times a wound of donkey should be washed in a day?	Once daily	1	1	Need correct answer
5.1	Next to the skin what type of harness should be used on the back of a donkey?	Old clothes Old Gabbii Old blanket	1	3	Need all 3 answers
5.2	To make the harness good and protect the donkey from the load tell us 3 things you should observe?	Cover back Cover sides Thick	1	3	Need all 3 answers
5.3	For the harness next to the skin of the donkeys what care should be taken?	Clean/wash regularly	1	1	Need correct answer
5.4	What can happen to a donkey with wounds?	Shorter life/may die Cannot work/less efficient More diseases	1	3	Need all 3 answers

Univariable analysis of variables considered for inclusion in multilevel, multivariable linear regression model (Short-term follow-up):

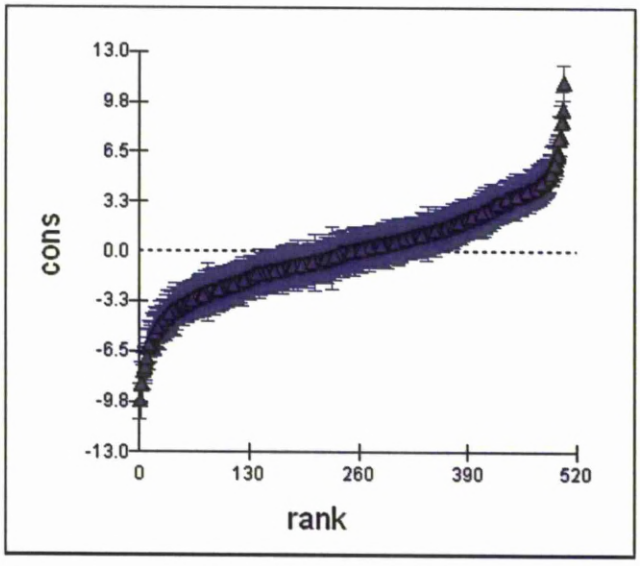
Variable		Coefficient	SE	Lower 95% CI	Upper 95% CI	P-value
Intervention	**Audio**	4.844	0.562	3.7425	5.9455	
	Handout	9.478	0.555	8.3902	10.5658	<0.001
	Village Meeting	9.662	0.548	8.5879	10.7361	
Pre-intervention Score		-0.263	0.065	-0.3904	-0.1356	<0.001
Age		-0.055	0.010	-0.0746	-0.0354	<0.001
Radio	**No**	Ref				
	Yes	0.762	0.384	0.0094	1.5146	0.05
Read O	**No**	Ref				
	Yes	2.102	0.362	1.3925	2.8115	<0.001
Read A	**No**	Ref				
	Yes	0.982	0.310	0.3744	1.5896	0.003
Number of Donkeys	**0**	Ref				
	1	1.170	0.673	-0.1491	2.4891	
	2	0.569	0.698	-0.7991	1.9371	0.2
	3	1.042	0.799	-0.5240	2.6080	
	>3	0.095	1.027	-1.9179	2.1079	
Formal Education	**No Education**	Ref				
	Adult Education	0.320	0.489	-0.6384	1.2784	
	Primary	0.867	0.390	0.1026	1.6314	<0.001
	Junior	1.838	0.506	0.8462	2.8298	
	Higher	1.989	0.514	0.9816	2.9964	
Own Cattle/Ox	**No**	Ref				
	Yes	0.372	0.625	-0.8530	1.5970	0.6
Own Sheep	**No**	Ref				
	Yes	0.712	0.344	0.0378	1.3862	0.04
Own Goat	**No**	Ref				
	Yes	0.228	0.383	-0.5227	0.9787	0.6
Own Horse	**No**	Ref				
	Yes	0.190	0.414	-0.6214	1.0014	0.6
Own Mule	**No**	Ref				
	Yes	0.548	0.992	-1.3963	2.4923	0.6
Own Dog	**No**	Ref				
	Yes	0.024	0.357	-0.6757	0.7237	0.9
Own Poultry	**No**	Ref				
	Yes	0.733	0.368	0.0117	1.4543	0.05

Model diagnostics for multilevel, multivariable linear regression model (Short-term model)

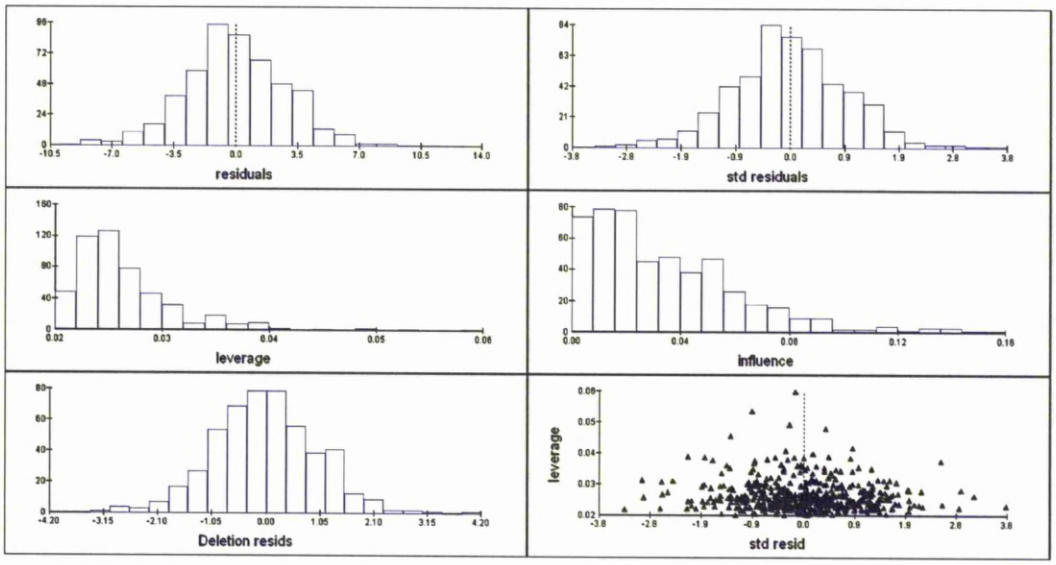
Level 1 (Participant level): Standardised residual x normal scores



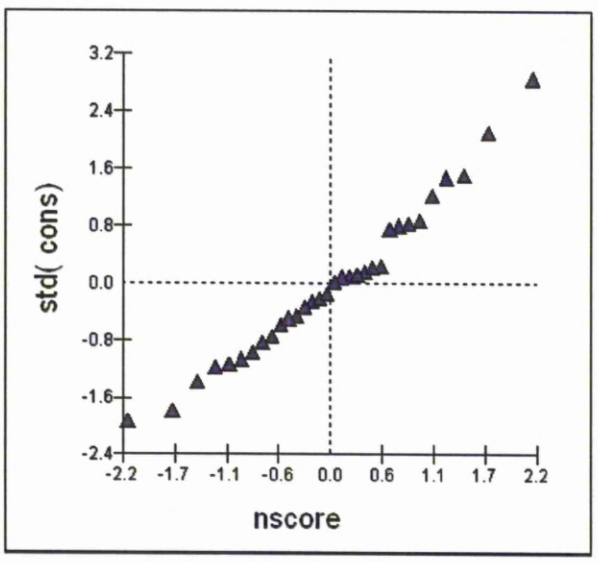
Level 1 (Participant level): Residual +/- 1.96 SD x rank



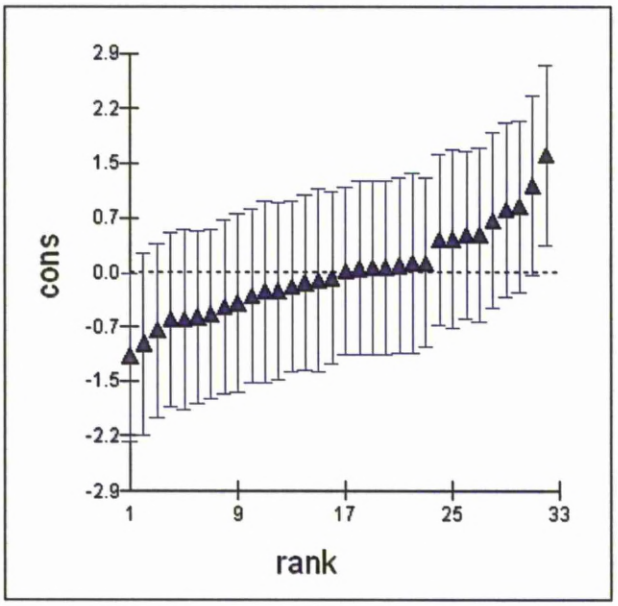
Level 1 (Participant level): Diagnostics by variable output:



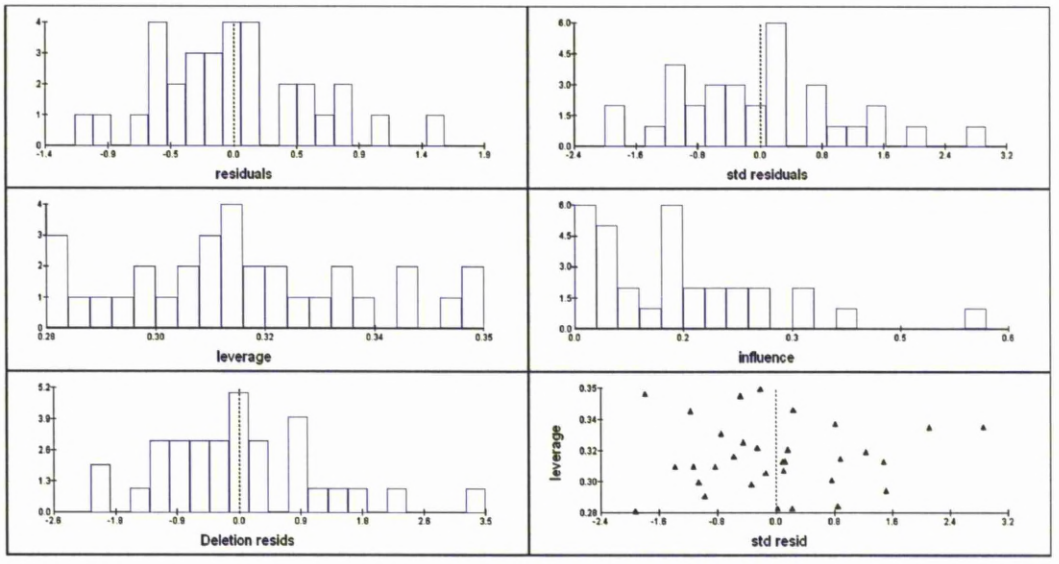
Level 2 (Village Level): Standardised residual x normal scores



Level 2 (Village Level): Residual +/- 1.96 SD x rank



Level 2 (Village Level): Diagnostics by variable



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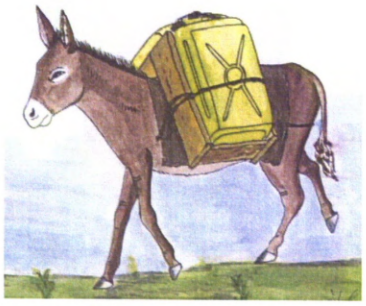

LONG TERM FOLLOW UP QUESTIONNAIRE

ID Number:	Name:
Date:	Gender:
DA Name:	Village (Kebele):

Method of education:

C	HO	VM	AO

Section 1: Wounds:

1. On which body part of the donkey that you are observing manmade wounds most frequently? (*Picture aid*)

2. What are the causes of manmade wounds of donkeys?

3. Tell us two signs observed on donkeys before a wound is occurring?

Section 2: Wound treatment:

4. What care should be taken before you wash the wounds of donkeys?

5. Tell us the best way that you should use to cure the wounds of donkey?

6. Tell us the bad ways that should not be used to treat the wounds of a donkey?

7. To wash wound of donkeys, how much salt and how much water should be mixed?

8. How many times a day you should wash wound of donkeys?

Section 3: Prevention:

9. What type of "baselayer" you have to use for your donkeys?

10. To make the harness good and protect the donkey from the load tell us 3 things you should observe?

11. For the "baselayer" of the donkeys what care should be taken?

12. What are the problems or effects of donkeys with wounds?

Section 4: Evaluation:

13. What is the main message you have learnt from this education?

14. Was there anything in the education that you would do now for your donkey?

15. Was there anything in the education that you would not do now, and why would you not do it now?

16. Have you changed your donkey's baselayer since our education?

17. What did you think about the handout/audio programme/education presentation that we gave you about wounds on donkeys?

18. What was easy to understand/clear about the "education"? (ALL FORMATS)

19. What did you not understand/not clear about the "education"? (ALL FORMATS)

20. Have you passed the information in the education on to anyone else? Who?

21. Did you read the handout? If no, did anyone read the handout to you? Who? Do you still have the handout? (HANDOUT VILLAGES ONLY).

22. Any other information about your donkey that you would like to tell us?

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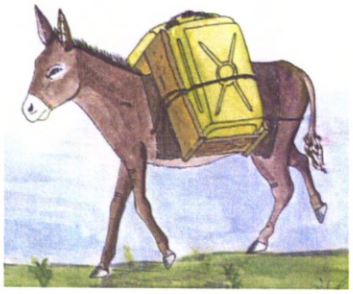


LONG TERM FOLLOW UP QUESTIONNAIRE

ID Number:	Maqaa:
Guyyaa:	Saala:
Maqaa DA:	Ganda:

Method of education:

C	HO	VM	A

Section 3: Wounds:

1. Nafa harrootaa irratti eddoo yeroo baay'ee madaan namaan uumamu mul'atu kami? (*Picture aid*)

2. Madaa namni harrootarratti uumuf kan sababa ta'u maal fa'a?

3. Madaan harroota irratti uumamuun duratti mallattoolee mul'atan lama himi?

Section 4: Wound treatment:

4. Madaa harrootaa dhiquun duratti of-eeggannaa godhamuu qabu maali?

5. Madaa harrootaa fayyisuudhaaf mala bayeessa fayyadamuu qabdu himi?

6. Madaa harrootaa fayyisuudhaaf mala fafee ta'e fi kan itti fayyadamuu hin qabne himi?

7. Madaa harrootaa dhiquudhaaf soogida hagami bishaan hagamitti makuu qabdu?

8. Madaa harrootaa guyyaatti yeroo meeqa dhiquu qabdu?

Section 5: Prevention:

9. Dabashni harree teessaniif fayyadamuu qabdan kan akkamiiti?

10. Kiskaasii mijeessufi ba'aa harree irraa dhoowwuf waan hubachuu qabdu sadi himi?

11. Dabasha dugda harreetti aanuuf of-eeggannoon godhamuu qabu mali?

12. Rakkooleen ykn dhiibbaan harroota madaa qabdurra ga'u maali fa'i?

13.

Section 6: Evaluation

13. Ergaa guddaan ati barumsa kana irraa baratte maali?

14. Wanti barumsa sana keessatti argamu kan ati amma harrataaf hojjettujiraa?

15. Wanti barumsa sana keessatti argamu kan ati amma hojjetuu hin dandeenye jiraa? Maaliif amma hin hojjenee?

16. Barumsa keenyan booda dabasha dugda harree teetii jijjiirtee jirtaa?

17. Kanaan dura waa'ee madaa harrotaa irratti bareeffamaan/sagantaa radiyootiin/ Barumsa kenname sanarratti yaadni kee maal fakkaata?

18. Barumsa sanarratti wanti ifa/salphaatti namaa galu maali?

19. Barumsa sanarratti wanti ifa/salphaatti namaa hingalle maali?

20. Ergaa barumsa keessatii argatte nama birootiif dabarsitee jirtaa? Eenyuuf?

21. Barreeffama sana dubbisteertaa? Miti yoo ta'e, namni biraa kan barreefama sana siif dubbise jiraa? Eenyu? Barreefama sana hanga ammaa qabdaa?

22. Waa'ee harroota keeti wanti biraa kan nutti himuu barbaaddu jiraa?

Univariable analysis of variables considered for inclusion in multilevel, multivariable linear regression model (Long-term follow-up):

Variable		Coefficient	SE	Lower 95% CI	Upper 95% CI	P-value
Intervention	**Audio**	3.64	0.48	2.71	4.57	
	Handout	10.31	0.47	9.38	11.23	<0.001
	Village Meeting	8.56	0.46	7.66	9.46	
Pre-intervention score		-0.36	0.07	-0.48	-0.23	<0.001
Age		-0.05	0.01	-0.07	-0.03	<0.001
Radio	**No**	Ref				
	Yes	-0.28	0.39	-1.04	0.49	0.5
Read O	**No**	Ref				
	Yes	1.83	0.37	1.10	2.56	<0.001
Read A	**No**	Ref				
	Yes	0.67	0.32	0.05	1.30	0.04
Number of Donkeys	**0**	Ref				
	1	0.24	0.68	-1.09	1.56	
	2	-0.40	0.70	-1.78	0.97	0.5
	3	-0.03	0.80	-1.60	1.54	
	>3	-0.16	1.13	-2.37	2.05	
Formal Education	**No Education**	Ref				
	Adult Education	0.03	0.49	-0.94	0.99	
	Primary	0.92	0.41	0.12	1.71	<0.002
	Junior	1.41	0.53	0.38	2.44	
	Higher	1.79	0.53	0.76	2.83	
Own Cattle/Ox	**No**	Ref				
	Yes	0.12	0.65	-1.15	1.39	0.9
Own Sheep	**No**	Ref				
	Yes	-0.59	0.35	-1.28	0.10	0.09
Own Goat	**No**	Ref				
	Yes	-0.20	0.39	-0.97	0.57	0.6
Own Horse	**No**	Ref				
	Yes	-0.17	0.42	-0.98	0.65	0.7
Own Mule	**No**	Ref				
	Yes	-0.52	0.98	-2.44	1.41	0.6
Own Dog	**No**	Ref				
	Yes	-0.76	0.36	-1.47	-0.04	0.04
Own Poultry	**No**	Ref				
	Yes	0.28	0.38	-0.47	1.02	0.5
Sought Advice	**No**	Ref				
	Yes	-0.30	0.44	-1.16	0.55	0.5
Give Advice	**No**	Ref				
	Yes	0.37	0.38	-0.38	1.11	0.3

Univariable analysis of variables considered for inclusion in multilevel, multivariable logistic regression model (Long-term follow-up):

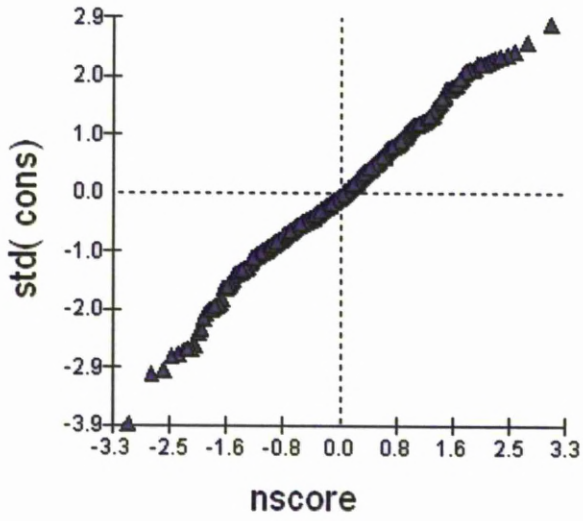
Variable		Coeff.	SE	Lower 95% CI	Upper 95% CI	OR	Lower 95 % OR	Upper 95 % OR	P-value
Intervention	Audio	1.774	0.193	1.3957	2.1523	5.89	4.04	8.60	<0.001
	Handout	3.168	0.185	2.8054	3.5306	23.76	16.53	34.14	
	Village Meeting	2.827	0.184	2.4664	3.1876	16.89	11.78	24.23	
Age		-0.018	0.003	-0.0239	-0.0121	0.98	0.98	0.99	<0.001
Radio	No	Ref							
	Yes	0.207	0.016	0.1756	0.2384	1.23	1.19	1.27	0.05
Read O	No	Ref							
	Yes	0.538	0.097	0.3479	0.7281	1.71	1.42	2.07	<0.001
Read A	No	Ref							
	Yes	0.434	0.085	0.2674	0.6006	1.54	1.31	1.82	<0.001
Number of Donkeys	0	Ref							
	1	0.198	0.186	-0.1666	0.5626	1.22	0.85	1.76	0.5
	2	0.118	0.192	-0.2583	0.4943	1.13	0.77	1.64	
	3	0.235	0.221	-0.1982	0.6682	1.26	0.82	1.95	
	>3	-0.106	0.295	-0.6842	0.4722	0.90	0.50	1.60	
Formal Education	No Education	Ref							
	Adult Education	0.136	0.129	-0.1168	0.3888	1.15	0.89	1.48	<0.001
	Primary	0.480	0.106	0.2722	0.6878	1.62	1.31	1.99	
	Junior	0.704	0.135	0.4394	0.9686	2.02	1.55	2.63	
	Higher	0.858	0.136	0.5914	1.1246	2.36	1.81	3.08	
Own Cattle/Ox	No	Ref							
	Yes	0.179	0.167	-0.1483	0.5063	1.20	0.86	1.66	0.3
Own Sheep	No	Ref							
	Yes	-0.116	0.094	-0.3002	0.0682	0.89	0.74	1.07	0.2
Own Goat	No	Ref							
	Yes	-0.044	0.104	-0.2478	0.1598	0.96	0.78	1.17	0.7
Own Horse	No	Ref							
	Yes	-0.051	0.119	-0.2842	0.1822	0.95	0.75	1.20	0.7
Own Mule	No	Ref							
	Yes	-0.363	0.349	-1.0470	0.3210	0.70	0.35	1.38	0.3
Own Dog	No	Ref							
	Yes	-0.187	0.094	-0.3712	-0.0028	0.83	0.69	1.00	0.05
Own Poultry	No	Ref							
	Yes	0.178	0.104	-0.0258	0.3818	1.19	0.97	1.46	0.09
Sought Advice	No	Ref							
	Yes	-0.067	0.120	-0.3022	0.1682	0.94	0.74	1.18	0.6
Give Advice	No	Ref							
	Yes	0.150	0.102	-0.0499	0.3499	1.16	0.95	1.42	0.1

Continued: Univariable analysis of variables considered for inclusion in multilevel, multivariable logistic regression model (Long-term follow-up):

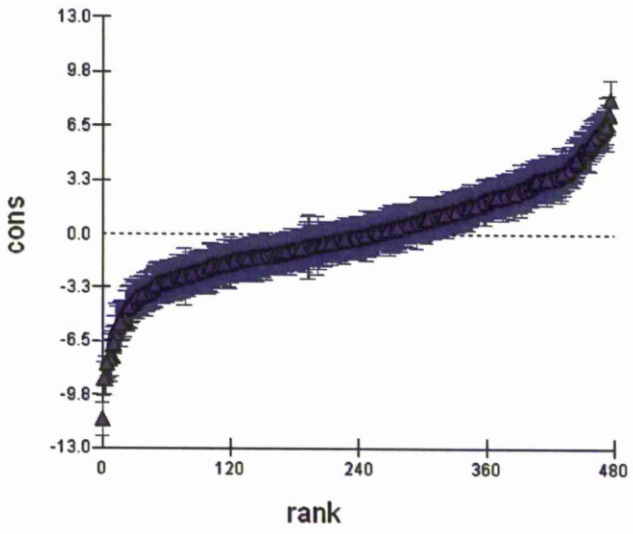
Variable		Coefficient	SE	Lower 95% CI	Upper 95% CI	OR	Lower 95 % OR	Upper 95 % OR	P-value
Question Number	5	Ref							
	1	-1.186	0.182	-1.5427	-0.8293	0.31	0.21	0.44	<0.001
	2	-4.758	0.250	-5.2480	-4.2680	0.01	0.01	0.01	
	3	-7.042	0.524	-8.0690	-6.0150	0.00	0.00	0.00	
	4	-2.583	0.191	-2.9574	-2.2086	0.08	0.05	0.11	
	6	-2.108	0.186	-2.4726	-1.7434	0.12	0.08	0.17	
	7	-2.785	0.193	-3.1633	-2.4067	0.06	0.04	0.09	
	8	-3.062	0.197	-3.4481	-2.6759	0.05	0.03	0.07	
	9	-3.774	0.212	-4.1895	-3.3585	0.02	0.02	0.03	
	10	-5.640	0.313	-6.2535	-5.0265	0.00	0.00	0.01	
	11	-2.833	0.194	-3.2132	-2.4528	0.06	0.04	0.09	
	12	-5.927	0.343	-6.5993	-5.2547	0.00	0.00	0.01	
Learning objective	3	Ref							
	1	-3.566	0.217	-3.9913	-3.1407	0.03	0.02	0.04	<0.001
	2	-0.084	0.144	-0.3662	0.1982	0.92	0.69	1.22	
	4	-1.632	0.152	-1.9299	-1.3341	0.20	0.15	0.26	
	5	-1.663	0.125	-1.9080	-1.4180	0.19	0.15	0.24	
	6	-5.830	0.507	-6.8237	-4.8363	0.00	0.00	0.01	
	7	-2.598	0.174	-2.9390	-2.2570	0.07	0.05	0.10	
	8	-4.437	0.287	-4.9995	-3.8745	0.01	0.01	0.02	
	9	-1.678	0.153	-1.9779	-1.3781	0.19	0.14	0.25	
	10	-4.722	0.319	-5.3472	-4.0968	0.01	0.00	0.02	
Question Type	2	Ref							
	1	-1.118	0.090	-1.2944	-0.9416	0.33	0.27	0.39	<0.001
	3	-1.483	0.096	-1.6712	-1.2948	0.23	0.19	0.27	
	4	-3.440	0.296	-4.0202	-2.8598	0.03	0.02	0.06	

Model diagnostics for multilevel, multivariable linear regression model (Long-term model)

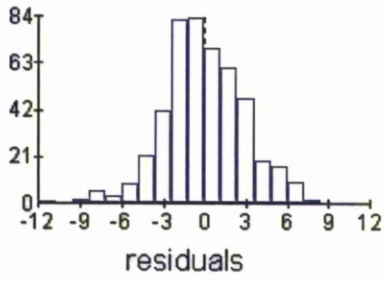
Level 1 (Participant level): Standardised residual x normal scores

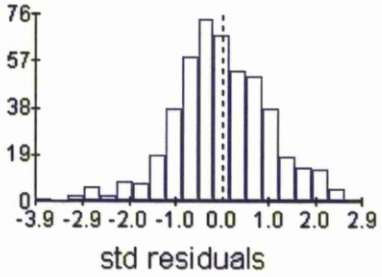


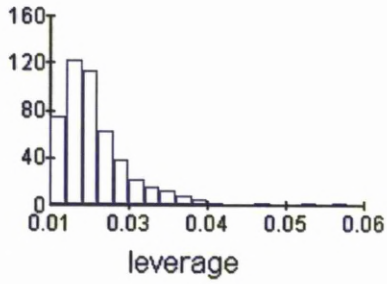
Level 1 (Participant level): Residual +/- 1.96 SD x rank

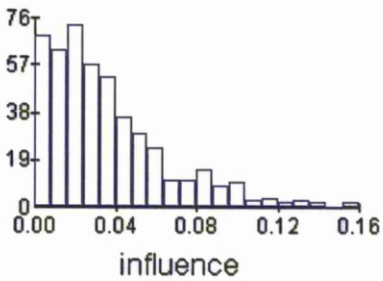


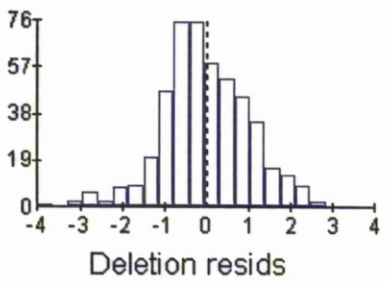
Level 1 (Participant level): Diagnostics by variable output:

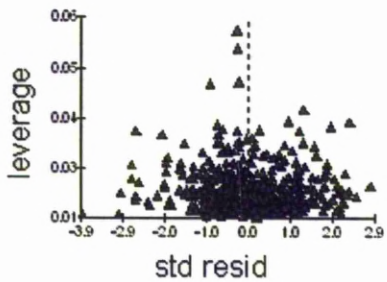




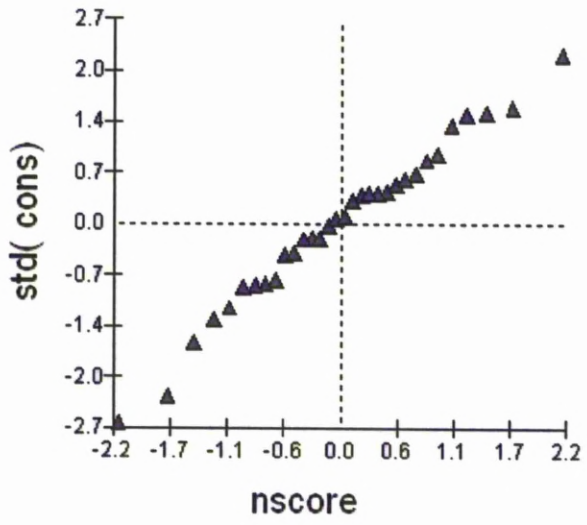




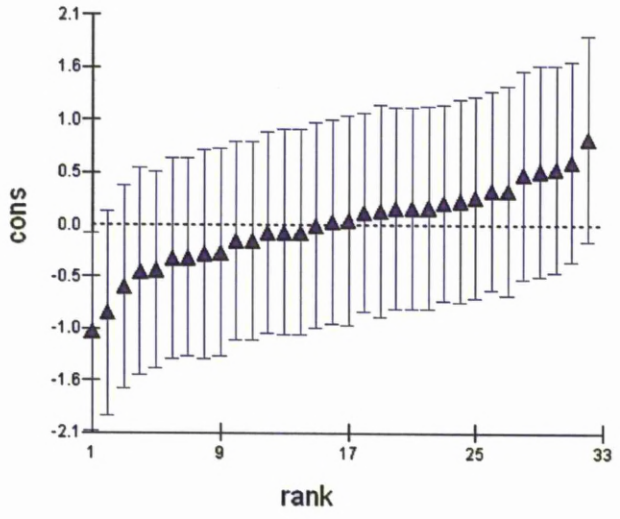




Level 2 (Village Level): Standardised residual x normal scores



Level 2 (Village Level): Residual +/- 1.96 SD x rank



Level 2 (Village Level): Diagnostics by variable