ADDIS ABABA UNIVERSITY
FACULTY OF VETERINARY MEDICINE

A RETROSPECTIVE STUDY ON THE IMPACT OF COMMUNITY BASED ANIMAL HEALTH SERVICE DELIVERY SYSTEM IN SHINILE ZONE, SOMALI NATIONAL REGIONAL STATE OF ETHIOPIA

A thesis submitted to the faculty of Veterinary Medicine, Addis Ababa University in partial fulfilment of the requirements for the degree of Master of Science in Tropical Veterinary Epidemiology

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ABBREVIATIONS

AAU	Addis Ababa University
AHAs	Animal Health Assistants
AHS	African Horse Sickness
AHTs	Animal Health Technicians
APDP	Afar Pastoralist Development Project
AU	African Union
CAH	Community-based Animal Health
CAHP	Community-based Animal Health Programme
CAHWs	Community-based Animal Health Workers
CAPE	Community-based Animal Health and Participatory Epidemiology
CAR	Central Africa Republic
CBPP	Contagious Bovine Pleuropneumonia
CCPP	Contagious Caprine Pleuropneumonia
CFT	Complement Fixation Test
CVAs	Community Veterinary Agents
ECC-SDCOH	Ethiopian Catholic Church Social and Development Coordinating Office of Hararghe
ECF	East Coast Fever
EPIAT	Ethiopian Participatory Impact Assessment Team
EU	European Union
FAHRs	Farmers' Animal Health Representatives
FITCA	Farming in Tsetse Controlled Areas
FMD	Foot and Mouth Disease
FVM	Faculty of Veterinary Medicine
GDP	Gross Domestic Product
Gov't	Government
HCS	Hararghe Catholic Secretariat
IBAR	Inter- African Bureau for Animal Resources
KVB	Kenya Veterinary Board
LSD	Lumpy Skin Disease
MoA	Ministry of Agriculture
NAHAs	Nomadic Animal Health Auxiliaries
NCD	Newcastle Disease

NGOs	Non Governmental Organizations
NLDP	National Livestock Development Project
NPIACT	National Participatory Impact Assessment Core Team
NPP	Negative Predictive Value
NVI	National Veterinary Institute
OAU	Organization of African Unity
OIE	Office International des Epizootics
PA	Pastoralist Association
PACE	Pan-African Programme for the Control of Epizootics
PAHC	Primary Animal Health Care
PAO	Food and Agricultural Organization
PARC	Pan-African Rinderpest Campaign
PDS	Participatory Diseases Searching
PE	Participatory Epidemiology
PPR	Peste des Petits Ruminants
PPV	Positive Predictive Value
PRA	Participatory Rural Appraisal
SERP	South Eastern Rangeland Project
SSI	Semi-Structured Interview
SNRS	Somali National Regional State
SPS	Sanitary and Phytosanitary Measure
SPSS	Statistical Package for Social Science
SWOT	Strength, Weakness, Opportunity and Threat
UN	United Nations
UNESCO	United Nations Education, Science and Cultural Organization
UNICEF	United Nations Children Fund
USA	United States of America
USAID	United States Agency for International Development
W	Kendall's Coefficient of Concordance
WTO	World Trade Organization

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ABSTRACT

The study was conducted to assess: the impact of community-based animal health workers' (CAHWs) activities on the livelihoods of the communities, the prevailing veterinary service delivery systems, the impact of community-based animal health workers' (CAHWs) activities on general livestock diseases reduction and to determine CAHWs livestock diseases diagnostic ability agreement test with the modern laboratory test results in selected areas of Shinile zone, Somali Regional State of Ethiopia. Secondary data were collected from project implementing NGO to determine the activities of CAHWs in vaccination and treatment of livestock, number of trained CAHWs and the training and refresher training programme. Active data were collected from 10 CAH intervention and 10 non CAH intervention sites using participatory rural appraisal (PRA) methods that included proportional piling, before and after proportional piling and matrix scoring through the participation of 300 community members and 10 CAHWs. Community-based animal health workers (CAHWs) livestock diseases diagnosis ability test was assessed to determine their performance agreement with modern laboratory test results, basically on the two most important diseases in the area i.e. trypanosomosis and CBPP. Livestock disease diagnosis ability agreement test of CAHWs was performed on blood samples that were collected from 101 animals then diagnosed by giemsa staining and complement fixation test (CFT) for trypanosomosis and CBPP, respectively. The general livelihoods of the community showed a significant increment in CAH intervention sites. CAHWs were found to be almost the only veterinary service providers and the most preferable ones in their intervention sites. Informants agreed significantly on the role of CAHWs services as CAHWs were very near to the community ($W=0.932$, $p<0.05$), had the required medicine ($W=0.902$, $p<0.05$), had capacity to immediately cure animals ($W=0.893$, $p<0.05$), gave good advice to the community ($W=0.982$, $p<0.05$), had affordable drugs ($W=0.909$, $p<0.05$), were trusted ($W=0.923$, $p<0.05$), and were supported by the community ($W=0.909$, $p<0.05$). The community also agreed that illegal drug dealers/black market and herder treatment were the only means to get veterinary service in non CAH intervention sites. The community confirmed that the CAHWs played an important role on general livestock diseases reduction in their intervention areas. Cattle diseases, which were treated by CAHWs such as dhigis (blackleg), boqta (pasteurellosis), cashi (helminthosis), dhawa (wound), haran (anthrax), sombob (CBPP), shillin (tick infestation), gofle (mastitis), sogudud (babesiosis) and ampbaar (mange) were decreased significantly after CAH intervention ($W=0.609$, $p<0.05$). Cattle diseases, which were not managed by CAHWs such as burbur (LSD), dheberjebiye (botulism) and cabeb (FMD), were still remaining static in CAH intervention sites ($W=0.609$, $p<0.05$). There was significant agreement among the informants in reduction of most diseases of sheep and goats ($W=0.575$, $p<0.05$) and camels ($W=0.712$, $p<0.05$) in CAH intervention sites. Informants did not agree non reduction of donkey diseases on CAH intervention sites ($W=0.206$, $p>0.05$) and sheep and goat diseases in non CAH intervention sites ($W=0.155$, $p>0.05$). Animal disease diagnostic ability of CAHWs showed significant agreement with the modern laboratory results in that Kappa values for mellig (trypanosomosis) on cattle, mellig (trypanosomosis) on camel and sombob (CBPP) on cattle were 0.654, 0.643 and 0.637, respectively. In conclusion, CAH service delivery system showed significant improvement in livelihood of community by reducing the general livestock diseases. Therefore, institutionalisation of CAH service delivery system and the sustainability of CAH projects should be given emphasis by the stakeholders for better achievement.

Keywords: PRA/Community/CAHWs/Livelihoods/Livestock diseases/Laboratory tests/Kendall's Coefficient of Concordance (W)

1. INTRODUCTION

Inadequacy of animal health services delivery due to various reasons in many developing countries has been reported (Zessin, 1996). In the 1980's, various international organizations noted that poor development of veterinary services exist in some areas of the tropics where livestock are highly valued, both socially and economically. Lack of veterinary services has been found to be a particular problem in more remote areas with harsh environment, difficult terrain and poor infrastructure (Catley *et al*., 2002). The problems were compounded by civil war in some regions, and the breakdown of veterinary services and infrastructures. The dry land of Africa and India, the mountainous of Nepal and Afghanistan, and the forests of South-East Africa have demanded new approaches to veterinary care in places where veterinarians were either unable or unwilling to venture (Catley *et al*., 2002). In line with this, many developmental agents including NGOs and UN organizations have recognized the shortcomings of the conventional veterinary service delivery system, and started using primary animal health care approaches in the delivery of animal health services in rural areas of developing countries since early 1970's. This approach has been selected and encouraged by these organizations because of its participatory nature, an approach popularised in rural development (Catley, 1999).

Veterinarians in Africa have been using participatory approaches and methods since the late 1980s (Catley *et al.,* 2002). Initially, the experiences have largely been delivered from community-based animal health projects and participatory rural appraisal type methods have been used during project design. Soon after participatory disease searching evolved in Pan-African Rinderpest Campaign (PARC), as a means to trace rinderpest foci in remote areas. Overtime, participatory methods have attracted increasing interest from veterinarians and are now used by a wide range of organizations. Participatory methods have been useful for developing good relationships with communities, understanding local knowledge and priorities, and have been found relatively inexpensive and flexible (Catley *et al*., 2002). Experiences show that training in participatory approaches and methods is particularly useful for veterinary staffs involved in community-based animal health workers services (Catley *et al.,* 2002). However, it should be noted that participatory assessment is not only about methods and tools, but also requires professionals to adopt a respectful, sensitive and open approach to work with communities. In community-based programme, veterinary staffs need

to recognize their own limitations and be willing to learn in partnership with local people (Catley *et al.,* 2002).

The World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary measure (SPS) agreement has established risk analysis as the basis for the regulation of international trade. The agreement has identified the Office International Des Epizooties (OIE) as the international body charged with drafting international standards for trade in animals and animal products, facilitating the exchange of animal health information and as a forum to coordinate trade risk analysis procedures (Catley *et al.*, 2004). The overall goal is to enhance the safety and quality of access to markets by increasing the objectivity and transparency of trade decision-making (Catley *et al.,* 2004). The decline of government veterinary services in developing countries has been accompanied by reduced disease reporting, particularly from more remote rural areas. The disparity between WTO requirements and the weak surveillance capacity of developing countries can be partly solved by better use of the network of CAHW, as that already exists. They are ideally placed to act as 'eyes' and 'ears' of the conventional surveillance system and can greatly enhance the sensitivity of a system, particularly when other components are constrained. In a recent review of CAHW networks relative to the OIE guidelines for the evaluation of veterinary services, it was noted that the guidelines offer scope for developing countries to demonstrate improved services and surveillance in marginalized areas through the use of CAH system (Catley *et al*., 2004).

According to the OIE code, veterinary services need to be able to show that despite communication difficulties, they maintain reliable knowledge of the state of animal health and the ability to implement animal disease control programme in a given zone. Community-based animal health delivery system have proven to be useful for improving both disease surveillance and disease control in such areas, and they can contribute to animal identification systems, tracing systems and animal movement control systems. Community-based animal health workers move with nomadic and transhumant pastoralists (Catley *et al.,* 2004). They offer the opportunity to coordinate animal health surveillance and control across wide areas. They make unique contributions in border areas, across frontiers and areas of insecurity where activities of conventional service providers are often highly restricted or prohibited (Catley *et al.,* 2004).

Many countries are now required to provide data to substantiate their national animal health status relative to trade. Regarding the impact of CAHWs on diseases reporting, experiences from different countries (Pakistan, Ethiopia, Uganda and Southern Sudan) indicate that CAHWs do, indeed, act as frontline reporters of epizootics disease outbreaks in remote areas (Catley *et al.,* 2004). The grass roots initiatives to improve livestock health service delivery in marginal areas of Africa have been the introduction of CAHWs. The primary objectives of the CAH programme is to supplement the existing but, overstretched professional animal health delivery system in marginal areas of many developing countries (Mugunieri *et al,* 2004).

By utilizing existing traditional knowledge, the CAHWs model encourages the participation of local communities in the design and delivery of animal health care services. The CAH initiative also empowers the local people to determine the type of animal health services that they receive. This approach has been shown to provide a unique framework for the full privatisation of animal health services in the marginal areas (Mugunieri *et al.,* 2004). In addition, they can contribute to animal identification systems, tracing systems and animal movement control systems.

Ethiopia with a total land area of 1.1 million sq. km and 71 million human populations has livestock population estimated to be 31 million of cattle, 42 million sheep and goats, 8.6 million equines, over 1 million camels, and 59 million poultry. The livestock sub-sector contributes about 33% of the agricultural GDP and 19% of export earning. The lowland part constitutes 65% of the country's area where 15% of human population, 20% of cattle, 25% sheep, close to 100% goats and the entire camel population exist. Whereas 85% of human population, 80% of cattle, 75% of sheep, and 90% of equines found in the highland part of the country that covers 35% of the total areas (Abebe, 2003). Even though the livestock sub-sector contributes much to the national economy, its development is hampered by different constraint. These include rampant animal disease, poor nutrition, poor husbandry, poor infrastructure and shortage of trained manpower (Abebe, 2003). Animal health service delivery has been shown to cover only 30% of the country's population (Zewdie, 2003). This low service coverage is attributed to lack of personnel, shortage of drugs and equipment, poor mobility and highland oriented animal health service delivery. With regard to veterinary personnel in the public sector, there are 446 veterinarians, 947 animal health assistants, 3436 animal health technicians, and 277 others meat inspectors and lab technicians (Zewdie, 2003). Community-based animal health programme has been considered as the only alternative way of delivering animal health service in pastoral and remote areas of the country. Subsequently,

Gov't and NGOs have developed CAH projects in Ethiopia, particularly in pastoral areas of the country (EPIAT, 2002). A total of 1512 CAHWs have been known so far who have been trained by the government and NGOs, of which the share of NGOs is 47%. Services that have been delivered by CAHWs included treatment with antibiotics, vaccination, deworming for internal parasites, spraying for external parasites, close castration, minor surgical treatments and report disease out breaks (Martin, 2001).

Inspite of the fact that CAHWs activity is expanding, the impact assessment of the activities has not been studied neither compared with the modern vet services (Martin, 2001).

Therefore, the objectives of this study are:

- to assess the impact of community-based animal health workers' activities on the livelihoods of the communities;
- to assess the prevailing veterinary service delivery systems;
- to assess the impact of community-based animal health workers' activities on the general livestock diseases; and
- to determine the agreement between community-based animal health workers' livestock disease diagnostic ability and laboratory test results.

2. LITERATURE REVIEW

2.1. General veterinary services

In principle, animal health delivery services system has been known to consist of curative, preventive, public health, promotional, regulatory and back-up or facilitating components (Mlangwa and Kisauzi, 1994; Zessin, 1996). In Africa, since the colonial times, veterinary service delivery has been the monopoly of the governments and their main emphases were on the control of epidemic diseases (Holden, 1999). Curative and other services were neglected although highly demanded by livestock owners who are even willing to pay for (Leonard *et al*., 1999; Leyland and Akabwai, 1998). Furthermore, the organizational structure of veterinary services did not change from that inherited at dependence in many countries of Africa (Cheneau, 1985). Leyland and Catley (2000) pointed further to the non-existence of veterinary services in pastoral areas and stated that if existing all services are deteriorating further. In response to this, development workers and economists have come up with economics theories and development concepts for suitable delivery systems in developing countries. Holden (1999) and Leonard *et al*. (1999) have described the theory of public and the private goods, which allows identifying and differentiating the role of the government and the private sectors in the veterinary service delivery. Mlangwan and Kisauzi (1994) and Zessin (1996) have suggested that the design of any services delivery should account for the production system as so-called client oriented services. Mlangwa and Kisauzi (1994) have advocated the development of private services, which should be based on auxiliaries and technicians rather than on self-employed veterinarians. Cheneau (1985) has favoured the use of auxiliary personnel to be paid by livestock owners associations. However, Leyland and Catley (2000) have proposed the linkage of private veterinarians to community animal health workers, where Schwabe and Kuojok (1981) and Zinsstag *et al*. (2000) have suggested the combination of human and livestock health services for pastoral communities.

2.2. The situation of animal health care in sub-Saharan Africa

2.2.1. Animal diseases and health constraints

According to Wolfgang *et al.* (1996) the animal health care situation in tropical and sub-tropical Africa has been characterized by production loss caused by diseases of at least

15-20% of the total production potential; high young stock mortality, ranging between 20 and 35% in East Africa and 25 to 45% in the Sahel countries; adult cattle losses of at least 10% in East Africa and up to 15% in the Sahel countries; economic loss due to diseases is US $ 4 billion annually, where US $ 2 billion is considered indirect loss due to impaired growth, infertility, and decrease output of milk and meat; and risk and loss caused by specific diseases. These diseases are:

* trypanosomosis : 44 million heads of cattle are exposed to trypanosomosis and losses are estimated at 3 million heads per year;

* tick borne diseases: 250 million heads of cattle are exposed to theileriosis. Losses are estimated to be 2 million heads per year. About 24 million heads of cattle are at risk for East Coast Fever (ECF) in 12 countries with losses of more than 1 million heads per year and this is equivalent to a direct economic loss of US $ 168 million. About 500 million heads of cattle are world wide exposed to babesiosis and anaplasmosis with losses of 0.25 million heads per year. Those at risk for heart water are estimated to be 175 million heads of cattle;

* rinderpest: losses due to rinderpest have been high in the past (in 1978, 100,1000 cattle in Southern Sudan; in 1983, 100,000 cattle in Cameron) and economic losses amounted up to US $ 3000 million for the period from 1983 to 1985; and

* losses due to reproductive failure leading to reproductive rates(calving rates of cattle) was in the range between 50% to 60% in Sahel countries and up to 65% in East Africa.

2.2.2. Constraints and deficiencies of government veterinary services.

According to Wolfgang *et al*. (1996), the situation of the government veterinary service has been largely characterized by a number of constraints in most of sub-Saharan Africa that include:

-super-centralization, i.e. all responsibilities, authority and means at head quarters;

-excessive bureaucracy, ignorance and lack of knowledge of regions' most specific conditions and requirements;

-lack of specific farming systems related requirements, negligence of farmers' needs, interests, priorities, resources and capabilities;

-making no efforts to achieve active participation of farmers in disease control, lack of planning data due to lack of baseline survey work and lack of monitoring and surveillance activities;

-inappropriate disease control concepts and strategies, insufficient coordination of co-operation and extension, research institutions and Universities; and

-giving little attention to veterinary public health aspects and lack of appropriate man power policy and proper manpower planning.

2.3. Primary animal health care

Martin (2001) defined community-based animal health as " animal health services provided by the community for the community". This means that community associations or individuals take the responsibility to plan, manage, deliver, and finance the provision of service to their own communities. Baumann (1990), however, defined the nomadic animal health auxiliaries (NAHAs) workers in Somalia as an independent, privately practicing, informally trained persons of pastoral origin who is not on the payroll of any government service or development project. NAHA is an auxiliary in the sense of being a self-employed complement to the official service, a person who lives a pastoral life himself. Deliveri (2000) defined these workers as farmers who are selected by their communities and then trained to provide a basic animal health services at a village level. "They may charge a fee for their service and charge for drugs that they administer, so they are in effect providing a private animal health service alongside the government service". CAHWs usually differ from other veterinary para professionals because those have been trained and salaried by state. CAHWs are generally unsalaried, work part-time, and usually have lower levels of education and training.

Primary animal health care (PAHC) has been applied to pastoral and their low input-output livestock production systems and in remote areas with poor infrastructures (Hüttner *et al*., 2000). Different names for these delivery systems in different places have been used, but, most share similar goals and features, which include:

-low-cost strategies for livestock health and management supported by a strong extension component, community participation and self help; and
-part privatisation and commercialisation of services, which involve measures ranging from long-term subsidization to complete cost recovery.

Success and benefits of this approach have been reported by Sollod and Stem (1993); Baumann (1990); Hüttner (2000); Leyland and Akabwai (1998) to mention only a few. Difficulties, problems and shortcomings in the use of PAHC have also been expressed. Turk (1995) mentioned, initial expenses and recurrent costs, labour requirement, long-term effectiveness, the difficulties in achieving the objectives, government policies and civil strife as some of the constraints to PAHC implementation. Leyland and Catley (2000) warned of the failure of the PAHC, as experienced the primary human health service, due to the lack of a common understanding of "community participation" eventually resulting in mass recruitment and training of CAHWs sidelining the role of the community.

The pastoral population of the sub-Saharan Africa has been estimated at more than 50 million people, of which Ethiopia, Eritrea, Sudan, Djibouti, Somalia, Kenya and Uganda account for about 16.5 million (Bonfiglioli, 1992). Pastoralists in Africa tend to inhabit the semi-arid and arid regions of the continent and typically, they derive at least 50% of their food and income from their livestock (Catley, 2002). Involvement of local people in veterinary service provision has been known to be practiced since the colonial period in many countries in Africa. Herders were trained as a vaccinators or disease reporters in Sudan, Nigeria, Uganda, Tanzania and North Somalia. During this time, the trained herders have been used to control diseases considered as a priority by the government (Catley, 1999). The idea has been later picked up again in the rangeland project of Ethiopia in 1976 (Sandford, 1981). In the Sudan, the paravet programme was stared in 1986 (Almond, 1991). In the 1980's, the approach has attracted increasing numbers of development agencies, as well as NGOs who used it widely in African countries (Catley, 1999).

Throughout the arid and semi-arid areas of the Greater Horn of Africa, conventional veterinary services have been found consistently failed to establish effective or sustainable systems of delivery. This lack of success has been associated with resource constraints, organisational weakness, professional biases against pastoralism and numerous logistical problems associated with servicing highly mobile communities in harsh terrains with limited infrastructures. The weakness of state veterinary services is exemplified by rinderpest

eradication campaigns, which were unable to reach communities or their cattle in more remote areas of Africa (Catley *et al*., 1998).

According to Catley *et al*. (1998), the community-based approach recognizes the weakness of public sector veterinary services. The community-based approach has been found to rely on at least five key features of pastoralism, which provide opportunities for alternative and more effective mode of animal health care. These are the fact that:

-for pastoralists, animal health is a priority and along with water, livestock disease usually features as the first or second most important problem during participatory need assessments and it is widely recognized that pastoralists possess detailed indigenous knowledge on livestock and wildlife diseases;

-pastoralists are willing and accustomed to moving long distances to access resources. Pastoral CAHWs are capable of moving with livestock herds and travelling to fixed-point outlet for veterinary drugs; and

-indigenous pastoral institutions are often well organized and can be effective democratic decision making units. Although some pastoral communities have been exposed to free or heavily subsidized veterinary services, they usually acknowledge the rational for payment for veterinary services at commercial rates.

Experience indicates that the problem of poor veterinary service delivery relates to availability of service rather costs. When considering herders ability to pay for veterinary care it should be realized that:

* pastoral communities have well established and complex social support mechanisms designed to assist the less wealthy and share key resources, and veterinary care is usually the only expense incurred by herders using extensive, traditional production systems; and

* with in pastoral communities, local definitions of poverty are often based on the ownership of too few or no livestock. Hence, the poorest pastoralists are often people who do not have animal to treat.

With in CAHWs projects, generally, in the Greater Horn of Africa, there is often a marked absence of quantitative data. When projects are established in emergency situations, convectional livestock disease surveys or livestock censuses are rarely conducted. Participatory assessments do yield data on which to base immediate inputs but typically, this data is disregarded by workers outside the NGO sector. In addition, due to the isolation of many pastoral areas baseline data has never been collected (Catley *et al*., 1998).

Community based systems have been significantly providers of animal health in the greater horn of Africa for over a quarter of a century. Community based animal heath builds on the concepts of community level assistants (veterinary scouts, dip attendants) who were essential components of the nascent state veterinary systems in East Africa, and of the community experts who treated livestock for reward in most African countries.

A recent survey by AU/IBAR/CAPE Unit identified over 230 organizations currently or recently involved in CAH in the nine countries of the greater Horn of Africa. Table 1 shows the distribution of the number of organizations in different African countries.

Table 1. Minimum number of organizations currently involved in CAH projects.

Country	**Number of organizations**
Kenya	72
Tanzania	48
Uganda	30
Ethiopia	24
Chad &CAR	21
Sudan	17
Somalia	17
Eritrea	1
Total	230

Source: Admassu (2003)

Mogga (2001) has reviewed literatures and estimated that since the early 1970s, CAHWs initiatives have been implemented in 46 Nations. As indicated in table 2, minimums of 22,041 CAHWs have been trained in the nine countries of the Greater Horn of Africa (Kenya, Uganda, Tanzania, Chad and Central African Republic, the Sudan, Ethiopia, Eritrea and

Somalia). CAHWs have been considered as the single largest professionally trained cadre of service providers (Admassu, 2003).

Table 2. CAHWs trained in nine-countries of Africa.

Country	Minimum CAHWs	CAHWs trained per organization	Estimated CAHWs
Kenya	7777	125	8652
Chad and CAR	7190	514	8218
Sudan	2138	126	2264
Tanzania	2031	58	2669
Ethiopia	1215	58	1389
Uganda	1110	46	1294
Somalia	505	84	673
Eritrea	142	142	142

Source: Admassu (2003)

2.4. Animal health services in Ethiopia

2.4.1. General animal health services

In 1993, Ethiopia was decentralized in to 14 regional states, which also resulted in the decentralization of animal health services except for the nationally sponsored vaccination campaign and disease prevention measures (Mogga, 2001). The veterinary service of the country has been organized both in the federal, as well as regional levels. In the federal, it is structured under animal and fisheries resources development and regulatory department and in the region; it is organized under regional states (Zewdie, 2003).

According to the workshop organized by FAO, EU and USAID (2001), the MoA of Ethiopia has established the following main duties and responsibilities for the federal veterinary service:

-formulation of appropriate national policies, strategies, programmes and projects for veterinary services, and preparation of up to date veterinary proclamations, regulations and directives and their amendments in light of new developments;

-coordination and implementation of the control of major transboundary diseases targeted for national control/eradication, and preparation of national animal disease emergency preparedness and contingency plan and establishment of an epidemic-surveillance system;

-securing an annual budget for the purchase of vaccine against O.I.E list A diseases, and development of various alternative models for national delivery of veterinary services;

-issuance of certificates of competence for veterinary drug importers before they obtain a business license, and insuring the quality, safety, and efficacy of veterinary drugs and biological, and responsibility for the issuance of international animal health and zoo-sanitary certificates for animals, animal products, and by-products exported out of the country; and

-responsibility for the quarantine and inspection of animals, animal products and by-products imported in to the country, and centre for animal health information and provides technical inputs.

Ministry of Agriculture of Ethiopia with the collaboration of FAO, EU and USAID (2001) has identified the main duties and responsibilities of the regional veterinary services as follows:

-designing and implementing regional livestock disease control programmes, and executing federal disease control/eradication programmes against major transboundary disease in their respective regions;

-providing veterinary public health services to insure wholesome meat and livestock products for human consumption, and providing a diagnostic service for livestock diseases;

-establishing effective passive and active disease surveillance systems through the involvement of all relevant actors, and training of all zones and woredas animal health staffs in livestock disease control and in disease reporting;

-training of CAHWs and AHT, and issuance of certificates of competence for those who want to open veterinary clinics, animal health posts, drug shops and pharmacy as a requirement for obtaining business licenses; and

-deliver clinical services through a net work of clinics and animal health posts, and improve the quality and coverage of public veterinary services through construction of veterinary clinics and health posts, equipping the clinics with basic clinical and field equipment, and supplying vaccines and drugs.

The disease situation in Ethiopia is alarming. Out of the 15 diseases classified as list A by the Office International des Epizootics, 7 of them are endemic in Ethiopia (Zewdie, 2003). These are CBPP, LSD, FMD, NCD, PPR, sheep and goat pox, and AHS. Furthermore, there are other diseases that are economically important including CCPP, trypanosomosis, anthrax, black leg, hemorrhagic septicaemia, and brucellosis. The wide spread prevalence of these diseases in the country has different effects like slow growth, difficult access to international markets, reduction of quality of hide and skins constrains to exotic breeds by tick-borne diseases and zoonotic diseases. It has been estimated that the direct loss due to mortality is 8-10% for cattle, 14-16% for sheep, and 11-13% for goats (Zewdie, 2003). Veterinary services are provided at clinical centres by a Woreda offices, which are managed with veterinarians and sub clinics at locations, managed by animal health assistants and technicians (AHA/AHT). Drugs supply at these clinics is unreliable (Mogga, 2001).

2.4.2. Veterinary manpower and infrastructure

The statistics of the veterinary personnel of Ethiopia has shown that, there are 500 veterinarians, 800 animal health assistants (AHAs), and 3000 animal health technicians (AHTs) in the public sectors. In the private sectors, there are 57 veterinarians, 58 animal health assistants (AHAs), and 102 animal health technicians (AHTs) in the private sector (Zewdie, 2003). Since 1979, the Faculty of Veterinary Medicine of Addis Ababa University graduates 16-30 veterinarians per year. The faculty also trains animal health assistants who are recognized as major work force in veterinary services delivery in the country (Mogga, 2001). The animal health assistants (AHAs) are trained for two years and annually around 80 AHA are graduated. Animal health technicians however, are trained nine months at regional training centre. As far as training uniformity is concerned, all veterinary professionals are trained on definite national curriculum (Mogga, 2001). Recently, a two year training AHA programme is entirely transferred from AA, FVM to one AHA training centre. And four new faculties of veterinary medicine will be opened in the very near future (Zewdie, 2003).

According to the MoA public veterinary service management, the veterinary structure of the public sector is composed of 937 clinics, 650 animal health posts, 10 regional veterinary laboratories, 1 vaccine production centre, 1 tsetse and trypanosomosis investigation centre, and 1 animal health research and referral centre. In the private sector, there are 64 clinics, 21 animal health posts, 164 drug shops, 127 drug importers, and 70 clinics with drug shops (Zewdie, 2003).

2.4.3. Animal health projects and service units

According to Zewdie (2003), a number of animal health projects are functional in Ethiopia today that include: pan African Rinderpest Campaign (PARC), Rift Valley Fever Project, National Livestock Development Project (NLDP), Pan-African Programme for the control of Epizootics (PACE), Farming in Tsetse Controlled Areas (FITCA) and Quality and Sanitary aspects of animal products, Feasibility study for establishing disease free zone.

The epidemiology unit of the veterinary service is performing disease-reporting activities. The unit collects passive and active data. Annual vaccination and treatment are entirely carried out by regional veterinary services, while, a cost of vaccine for list A diseases is covered by the federal government (Zewdie, 2003).

2.4.4. Primary animal health care

Primary animal health care activities have been started since 1976 by the World Bank fund project in the Borena region (Sandford, 1981). However, the lack of trained manpower and inadequate operational government funds coupled with lack of infrastructures resulted in poor veterinary services in the remote area of the country (Mogga, 2001). Thereafter, community-based animal health programme has been accepted in Ethiopia to complement the existing veterinary services because the public service has been plagued by many problems such as inadequate manpower and logistical inputs and poor communication facilities (Abebe, 2003). Moreover, the few public clinics present in the country are located in the major towns and provide services mostly to cattle owners residing in and around these towns. Curatives and preventive services have been documented not to be available to the vast majority livestock owners in pastoral areas of the country. The problem has been more aggravated not only by shortage of staff but also by inadequate operational budget for animal health services compared to the magnitude of the disease problem in the country. Besides, staff mobility has

been very limited and only occasionally do staff venture outside clinics to investigate outbreaks and render services (Nega, 2003).

Therefore, the need for the community animal health programme increasing rapidly. To date 1494 CAHWs have been trained by different institutions. The federal MoA animal health policies have recognized CAHWs as primary health providers and much is undertaken by the PACE project. Training of trainers' manuals and training curriculum on the community-based animal health workers developed by PACE project (Nega, 2003).

No policy or legislation concerning the use of PAHC exists in Ethiopia. Nevertheless, the government veterinary services have been using this approach in many of its projects such as PARC (Admassu, 1996), the Afar Pastoralist Development Project (APDP) (Dawit, 1992), the Third and Fourth Livestock Projects TLP/FLP (Mogga, 2001) and the South Eastern Rangeland Project SERP. Nowadays, primary animal care has however become an area of discussion and dispute with in the veterinary profession at a number of professional veterinary association meetings and national workshops (Mogga, 2001).

2.5. Community participation and sustainability of CAH service delivery

According to Nega (2003), the elements necessary for the successful implementation of a sustainable community based animal health care strictly followed by implementers are:

-site selection based on community support and need assessment ,and cooperation/participation of veterinary authorities; and

-ethno-veterinary studies and disease ranking, selection of drugs supplies, establishing a drug procurement chain and realistic fee schedule;

Despite the importance of community participation in CAHW projects, it is common to find projects that were established by veterinarians with limited knowledge of community-based method of working. This problem applies to both government and NGOs and indicates the investments in staff training are an important step in developing sustainable community based services (Catley *et al.,* 2002).

As per the description of (Catley *et al.,* 2002), typical and known problems with more (top-down) style of implementation have been found to be:

-failure to address the communities' most important livestock health problems, and failure to select CAHWs using locally defined criteria for selection;

-rushed selection of CAHWs by the community or selection by single, powerful community member rather than patient, careful, and transparent selection via community meetings and discussions, confusion over the role and responsibilities of the CAHWs and the project staffs-lack of important training approaches and method; and

-confusion over the type of service offered by CAHWs and the price of veterinary medicines and the financial incentives for the CAHWs.

In East Africa, field staffs working on community based animal health care realized the weakness in their dialogue with livestock keepers as a matter of facts, the root causes of the problems that have been discussed with the various organizations concerned and to some extent lie with the skills and knowledge of the field staff. Many of the field staffs said that they were unclear about all the issues they should be discussing with the community, and how to actually carry out effective community dialogue. Community dialogue is probably the single most difficult task in developing community-based projects, but with out it the programme has little chance of success. The field staffs are asked to do a very difficult job. Thus, they must be provided with the skills and knowledge they need (Catley *et al.,* 2002).

A future imitation to the effectiveness of the community livestock workers is the confusion surrounding their legitimate role as livestock service providers. This includes the level of education and information available to communities and other service providers about the aim of the community livestock workers programmes. Despite initial meetings, many providers remain unclear as to the precise role and training of community livestock workers (Catley *et al.,* 2002).

2.6. Selection criteria, training, duties and responsibilities of CAHWs

2.6.1. Selection criteria

Together with inputs from project staffs, community leaders determined the selection of CAHWs. There have been some variations on the educational status of trainees. Literate and illiterate CAHWs have been trained. Several projects describe specific selection criteria (Catley *et al.,* 2002) and the following common factors were recognized as being beneficial by different projects:

-livestock ownership, recognized and respected locally; and

-not being employed in another occupation , being married, and enthusiastic/willing to accept responsibilities

Ideally, the trainees have been suggested to be selected by the community itself and they should be willing to serve the community. Moreover, the trainees should be prepared to serve for a reasonable period and be unlikely to leave soon after training has been completed. It is not essential that they are able to read or write, although it is an added bonus if they can. Illiteracy should not prevent otherwise suitable candidates from being trained. Ideally at least two trainees per community should be trained so that if one is sick or leaves the community then there is still one remaining (Catley *et al.,* 2002).

The prospective CAHW candidates should be selected very carefully by the community using criteria agreed in advance in public. The selection should be done in consultation with a veterinarian or AHT who will be responsible for supervising and providing the inputs to these CAHWs. Successful candidates should be trained so that at the end of the training, and with the necessary supervision they can effectively alleviate some of the major livestock health problems affecting that community (KVB, 2002).

According to Kenyan Veterinary Board (2002), the main CAHWs selection criteria include:

-own livestock , be a member of a community and well known to them;

-be a keen to be selected , willing to learn and livelihood should be based on livestock;

-be hard working , self-motivated, and physically fit to handle livestock;

-be willing to travel to where the livestock are grazing, well behaved and trusted;

-have good communication abilities and be knowledgeable about traditional livestock management; and

-be willing to devote his/her time to delivery of animal health to the community members, willing to be supervised by the community and a registered veterinarian or AHT and his/her delegated agents and some basic academic knowledge will be an advantage.

2.6.2. Training of CAHWs

Training of CAHWs has been indicated as the high point when setting up a community-based animal health system and is received with much anticipation by the community. The formal teaching approach may be appropriate for University course where a large amount of subject matter is covered and students are expected to carry out self-learning in their free time. However, experience in community animal health and other rural development project has shown that this approach is rarely effective for training livestock keepers (Catley *et al.,* 2002).

Based on Catley *et al*. (2002), adults have been found to learn best when:

-the training is relevant to their daily lives and they come to learn voluntarily;

-they can share their own experience through discussion and earn skills practically; and

-the training fits their cultures, the trainers use discussion, picture, play, song, drama experience and visual aids (picture, model, photographs and slides), and they understand the objectives of the training.

Many livestock keepers have not had the opportunity to attend formal schooling and some may not be literate. However, they do have a great deal of experience, skill and knowledge of managing farms and livestock systems in complex and unpredictable environment. Experience has shown that farmers and pastoralists usually want to learn more about looking after their animal and want to take active role in learning process. They want to learn from

each other, share ideas, and experiences, be challenged, analysed problems and draw their own conclusions. The learning need to be a process of discovery, therefore, training courses need to encourage the active participation of trainees (Catley *et al.,* 2002).

In accordance with the workshop organized by FAO, EU and USAID (2001), there are large ranges in the duration and depth of the training of CAHWs in pastoral areas of Ethiopia, ranging from 10 days to 3 months. The location of training also varies from community, environments and district agricultural offices to a veterinary faculty. Refresher training courses are routinely performed, usually in the field and of 5-7 days duration. Training topics were varied reflecting the differing periods of offering. Common subjects include: clinical diagnosis of common economically important diseases, vaccination and correct administration of drugs, ecto and end-parasite control, recording, book keeping and elementary business training (Catley *et al.,* 2002). Other topics covered by some programmes were mechanisms of disease transmission, veterinary public health and basic animal husbandry and production and basic surgical procedures such as castration and wound and abscess treatment. For some reinforcing ethno-veterinary knowledge was important (Catley *et al.,* 2002).

The aim of participatory training methods is to encourage the active participation of the trainees by posing problems and providing a forum for analysing and discoursing solutions. These processes take time and can be complex to organize compared with convectional methods. Farmers and CAHWs far more likely to acquire skills and remember what they have learned (Catley *et al.,* 2002).

2.6.3. Duties and responsibilities of CAHWs

According to MoA and PACE (2003), the roles and responsibilities of CAHWs in Ethiopia are classified as follows:

-Primary roles: -identify and diagnose sick animals, treat the sick animals, and record such treatments (the type and dosage of the drugs used) and make the necessary follow up of the cases; refer difficult clinical and surgical cases to the supervising veterinarian or AHA; report occurrence of livestock disease out break (notifiable diseases) to the district veterinary service, the supervising veterinarian or AHA; and provide extension message on disease control and prevention.

-Secondary roles: -advice livestock owners on marketing of livestock and livestock products; promote ethno-veterinary usage and conservation of biological sources of ethno-veterinary production; and advice the communities on public health issues including meat and milk hygiene to avoid zoonotic diseases.

The Kenyan Veterinary Board (2002) has described the primary and secondary roles of CAHWs in Kenya as follow as:

* Primary roles:

-treat the sick animals, record such treatments (the type and dosage of the drugs used) and make the necessary follow up of the cases; refer difficult clinical and surgical cases to the supervising veterinarian or AHT; advice livestock owners on marketing of livestock and livestock products; promote animal welfare; promote ethno-veterinary usage and conservation of biological sources of ethno-veterinary products; and

-report occurrence of livestock disease, including notifiable diseases to the department of veterinary service or the supervising veterinarian or AHT; prevent disease occurrence through vaccination; promote good livestock management practices; monitor herd health and production and collect samples from sick animals and submit them to the supervising veterinarian.

* Secondary roles:

-provide extension messages on disease control and prevention; provide advice on breed management; advice communities on public health issues including meat and milk hygiene to avoid zoonotic diseases; and

-promote sharing and conservation of natural resources and the environment; sensitise the communities on policy and legislative issues relating to the livestock sectors with particular emphasis on handing of veterinary drugs, quarantines and livestock movement and their relevance to disease control; recognize the most common diseases that occur in the region and identify and diagnose sick animals.

2.7. Participatory Epidemiology

Participatory appraisal has been defined as the term, which refers to a range of methods for data collection, learning and facilitation enabling local people to pay a role in defining, analysing and solving their problems (Catley, 2002). In other words, participatory epidemiology has been defined as the application of participatory rural appraisal (PRA) techniques to the collection of epidemiological information that utilizes the PRA toolkit of methods. These methods have been grouped as secondary sources, direct observations, interview techniques, visualization techniques and methods of ranking and scoring (Catley and Mariner, 2001).

Secondary data: -has been used to describe the existing literature, reports, maps and databases on the communities and issues under studies. All good PRA studies begin with an inventory of secondary sources and a review of these sources.

Direct observation**: -** has been referred to observing the environment and daily activities of livestock owners. One of the simplest starting points is has been focused when get out and walk through the village or cattle camp and surrounding pasture as well as observe the condition of the people, livestock housing and pasture. Try to be present for production activities like milking and note who is carrying-out the tasks and how they are completed.

Semi-structured interview: - has been used as one of the main tools of participatory epidemiology permitting a checklist of subjects to be covered is used as a point of reference rather than a questionnaire. The interview team makes use of open- ended questions to allow participants the opportunity to introduce topic. Probing questions are asked to obtain more detail and check information for internal consistency.

Visualization techniques: **-** has been used as techniques that include approaches such as map, venn diagram, timeline and seasonal calendar construction. Mapping usually has been involved clearing an area of sand and sketching with stick the relative location of key resources and strategies used by the community from the key resources and strategies. This includes things such as grazing areas, cultivation areas, water sources, salt sources, woodlands, wild foods, wild life habitat of insects vectors of diseases, friendly and unfriendly neighbours, trade routes, seasonal movements, and emergency movements. Using this approach, the appraisal team can very quickly obtain an overview of the area and the spatial

distribution of key resources. In epidemiology, the spatial relation ship between communities, their social relations and movement patterns go along way to wards determining livestock contact patterns and are key to understanding the epidemiology of infectious disease. Timelines and seasonal calendars are very powerful tools for describing the temporal patterns of disease in a location.

Ranking and scoring: - has been referred to a group of techniques used to prioritise information or provide semi-quantitative estimates of the relative size or impact of categories as perceived by the participants. In ranking, the respondents are asked to place items in their order of priority. A more systematic alternative is pair-wise ranking where the respondents are asked to identity, which is the more important disease of each possible combination of two diseases from the list. Proportional piling is very flexible technique in which respondents are asked to divide 100 objects such as seeds or stones into piles of sizes representing the relative size or importance of different categories. The number of objects in each pile is then counted to give a score. These exercises can be repeated in subsequent interviews and the results analysed statistically.

In the process of data collection, the use of probing questions is an important quality control tool to assess the internal consistency of reports. Once a body of information is obtained from a series of interviews and data collection exercises, the information can be assessed through the process of triangulation. The term triangulation simply means comparing information obtained from multiple informants and multiple methods to look for patterns. An important advantage of participatory epidemiology (PE) is that it provides a high degree of flexibility. The study teams can review the information available and refine the study hypothesis. The teams has the opportunity to include new questions or data collection exercises as a result of information discovered during the PRA processes. The teams can present the scenario back to the participants. The participants can then add, subtract or clarify information in the best-bet scenario (Catley and Mariner, 2001).

Participatory epidemiology has been first developed, as a project needs assessment tool. It has also found application in animal health project monitoring and evaluation. The technique can be used to track changes in diseases impact over time as well as to collect the perceptions of beneficiaries and other stakeholders on the impact of the project, weakness and possible ways to improve performance. Perhaps, PE has an important application as an epidemiological surveillance tool. In participatory disease searching (PDS), questions are

asked about general animal health concerns. If the target disease is identified as a problem, probing questions can be asked about the target diseases in combination with other subjects. The investigation seeks to establish the history of the disease in a community and trace reports forwards and backwards in time. Herders guide the disease search team to active cases of diseases that can then be confirmed by laboratory diagnostic methods. Another promising applications of PE is in the general disease surveillance (Catley and Mariner, 2001). The specific methods and processes that are most useful for PDS are: open- ended questions, probing, time-line, triangulation (cross-checking of reports and data from different sources), use of key informants, mapping, and clinical observation and transects (Admassu and Mariner, 2001).

3. MATERIALS AND METHODS

The study was conducted in Shinile zone of the Somali National Regional State of Ethiopia from September 2003 to June 2004. Secondary data on cost recovery, training and refresher training manuals, number of trained CAHWs and their activities such as treatments and vaccinations were collected in the respective CAH programme. Data were collected using participatory rural appraisal (PRA) methods. CAHWs livestock disease diagnosis ability test agreement with laboratory test results and SWOT analysis of CAH delivery system were also performed.

3.1. Description of study areas

3.1.1. Somali National Regional State (SNRS)

The Somali National Regional State (SNRS) is located in the South-eastern part of the country. It covers 333,400km^2 and administratively divided into 39 woredas and 9 zones as indicated in figure 1(Yesuf, 2002).

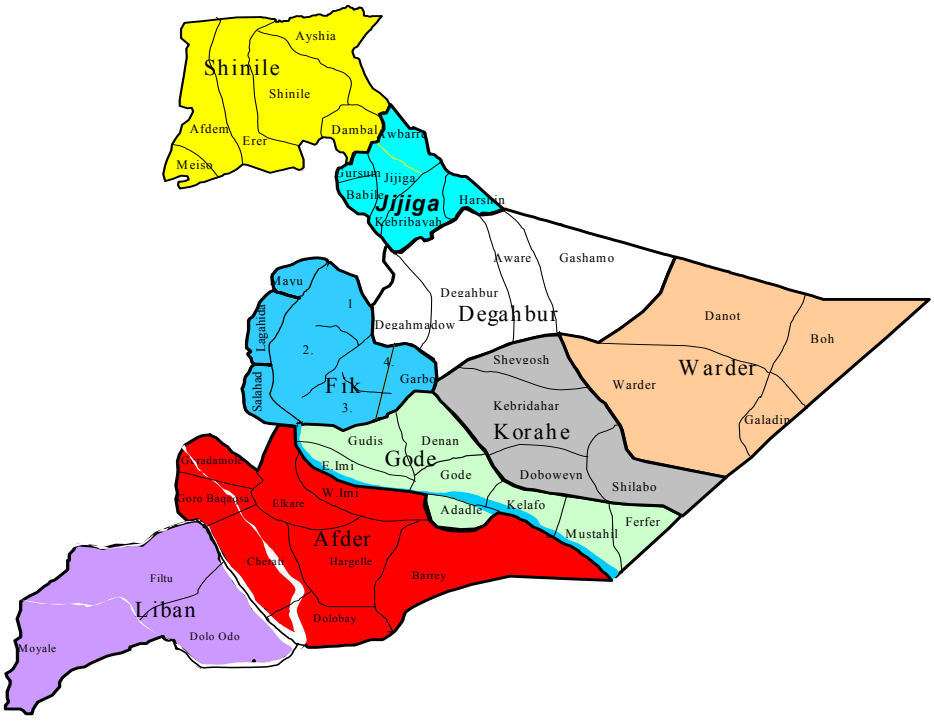

Figure 1. Nine zones of SNRS

Somali society is largely a pastoralist society, which has adapted over many years to survive in a semi-arid environment. The SNRS has huge livestock resources that include 3746000 cattle, 9053000 sheep, 8547000 goats, 2032000 camels and 21300023 equine. Pastoralists comprise 85% of the population in the region. Regarding the regional animal health service delivery, lack of facilities such as means of transportation, operational budget, infrastructure and shortage of qualified manpower have been hampering the extension programme highly. Currently, there are 15 veterinarians and 57 AHAs employed by the government in SNRS (Yesuf, 2002). The region is very vast and shares a long border of around 2050 km with Kenya, Djibouti and Somalia. Communities are highly mobile and livestock across borders is so frequent, there is high risk of transboundary diseases entering the region (Yesuf, 2002).

3.1.2. Shinile zone of Somali National Regional State

Shinile is one of the 9 Somali National Regional State (SNRS) zones located in the northern tip of the region. As indicated in figure 2, Shinile shares international boundary with Djibouti and Somalia in the North and to the East respectively and also boarders the Eastern and the Western Hararge zones of Oromia, South Eastern part of Afar National Regional State and the Dire Dawa administration council. The climatic condition of the zone characterized by arid and semi- arid climate with annual rainfall 300-600 mm. The entire Shinile zone is a drought victim area. The inhabitants define drought in terms of a decrease in livestock number, predominance of health problem, decrease in vegetation coverage, shortage of water, etc (Eshetu, 2003).

The Shinile zone is characterized by low and erratic rainfall of high annual and seasonal variability. The rainfall has a bimodal nature from March to May and from July to September. The rain is inconsistent in terms of coverage and amount (Eshetu, 2003). The main source of water both for human and livestock consumption in the zone are wells, springs and rivers. There are some rivers flow through out the year namely; Erer, Hurso, and Biyo Keraba that can serve some villages of the Erer and Afdem districts. The Somali region is endowed with a large number of livestock resources (estimated over 2.4 million), which supported 80% of the population (Eshetu, 2003).

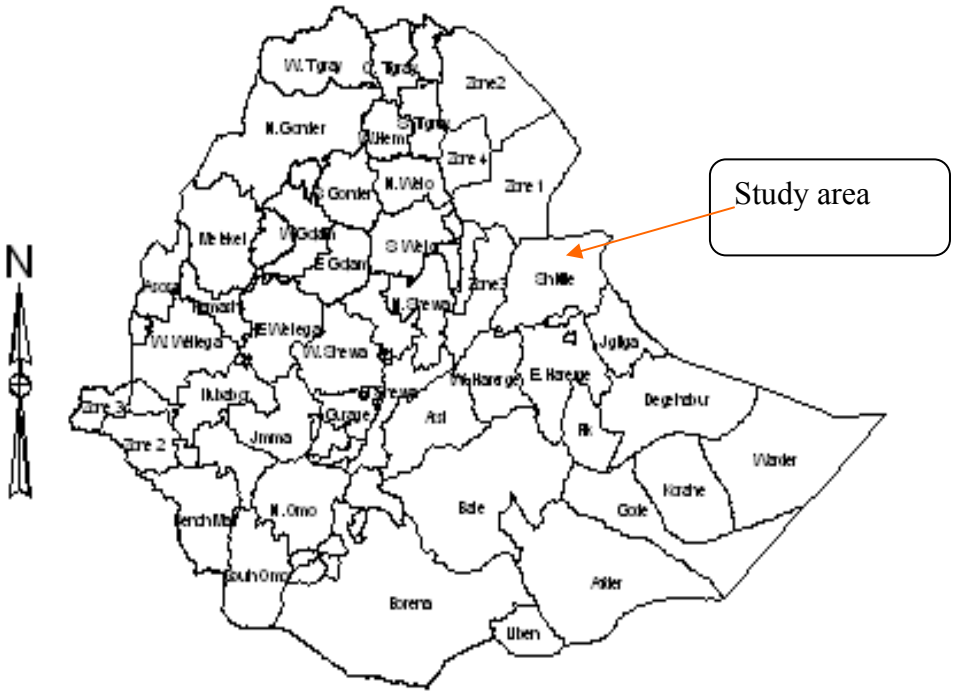

Figure 2. Study area

Shinile zone is sub-divided into six woredas namely; Aysha, Shinile, Afdem, Dembel, Erer and Meisso with 338,337 inhabitants and more than 2 million heads of livestock. Ecologically, the zone is divided into two broad categorist: the first one is a pure pastoralists, which consists of the districts like Aysha, Shinile, most part of Afdem and part of Meiso and the second category is agro-pastoral ecological zone that comprises the small part of Afdem, most part of Dembel and parts of Meiso. Somali and Oromo are the major ethnic groups live in the zone with the dominancy of Somali. There are four main Somali clans in the zone namely; Issa, Gurgura, Hawya and Gadabursi (Eshetu, 2003).

In the zone, pasture land is used communally. Even though this communal ownership contributes to overgrazing and rangeland degradation, the pastoralists move from one pastoral area to the next every three months. According to the inhabitants, this is the normal cycle. It occurs when the weather condition is conducive for both human and livestock life. During drought period, pastoralists migrate to distant areas to look for pasture and water but this migration is limited with in the same clan territory. In drought period, pastoralists grouped their herds in to moving and village groups. People used to restrict certain pasture lands from grazing during wet season of the year to reserve the pasture for village group animals

(lactating cows, calves and weak animals) for dry period. In the dry season, livestock migrate to dry season grazing areas where more permanent water sources are available (Eshetu, 2003).

Major crops grow in the agro-pastoral areas of the zone are sorghum, maize, and vegetables. Livestock performance is the most important elements of pastoral households providing milk and other products during good production years. Moreover, livestock and its products take considerable share of households' income to purchase food items such as cereals, oils and sugar when crisis comes (Eshetu, 2003).

3.2. Study population

The study was conducted with herders/livestock owners, CAHWs, veterinarians, AHA, AHT. Cattle and camels were used to study CAHWs diagnostic ability test agreement with that of laboratory test results.

3.3. Study procedures

3.3.1. Stratification of the study area and study population

The study areas were stratified in to woredas based on the availability of CAHWs and the time of the start of the respective CAH projects. Livestock owners were interviewed in-groups and individuals interviews. CAHWs and public veterinary professionals were included for individual and group discussion

3.3.2. Sampling methods and strategies

3.3.2.1. Impact of CAHWs

Purposive sampling was used to select the study areas. Ten PAs from CAH intervention sites were purposefully selected by Shinile Zone, Woredas and HCS vet professionals based on the availability and accessibility of CAHWs. Comparative study was made on ten PAs from non CAH intervention sites with similar socio-economic and geographical situations with CAH intervention areas. Consequently, 15 pastoral community members comprising 20 and above age range were selected from each PA randomly and interviewed for individual and group discussion and therefore, 300 pastoral community members/herders, 10 CAHWs and veterinary professionals (vets, AHA, AHT) were participated in the study.

Participatory epidemiology methods such as semi-structured interview, proportional piling, before and after proportional piling and matrix scoring were used to collect the required information.

3.3.2.2. Diagnostic ability of CAHWs

Eight CAHWs participated to select animals that were sick and free of trypanosomosis and CBPP based on their routine diagnsis ability. A total of 101 blood samples were taken from sick and healthy cattle and camels to see the diagnosis test agreement between CAHWs disease diagnosis ability and laboratory test results for the two important diseases (trypanosomosis and CBPP) in the area. For sick animals category, blood samples were taken from 19 cattle for CBPP, 12 cattle for trypanosomosis and 10 camels for trypanosomosis. From healthy animals category, blood samples were taken from 20 cattle for CBPP, 25 cattle for trypanosomosis and 15 camels for trypanosomosis to confirm the diseases by laboratory tests. Giemsa staining (thin smear) and complement fixation test were the methods used to diagnose trypanosomosis and CBPP, respectively.

3.3.2.3. Veterinary service

Strength, weakness, opportunity and threat analysis of CAH service delivery system in Shinile zone was performed with 2 zonal veterinary service coordinators, 2 veterinarians, 2 AHTs, 4 AHAs and 10 CAHWs.

3.3.3. Secondary (passive data) collection

Secondary data were collected from implementer non governmental organization (Hararghe Catholic Secretariate) concerning CAHWs initial intensive and refresher training, number of trained CAHWs, activities done by CAHWs, revolving fund management and CAHWs reporting system.

3.3.4. Primary (active) data collection

3.3.4.1. Participatory epidemiology

Informants were requested to identify the local indicators for the parameters that were mentioned by them. They were arranged to sit in convenient places in a way that all

participants see the objects or gravels clearly then they discussed and scored. Informants were made free to increase, decrease or leave the pile according to scores of an indicator. They were also allowed to arrange the piles until they had arrived at the result all agreed. Before conducting the interview exercise, an introduction explaining the purpose of the exercise was carried out with the informants. A checklist, serving as a guide and consisting of the main points to be investigated during the SSI was prepared, pre-tested and adjusted accordingly in the study sites prior to the investigation proper. Small size counters (gravels) were used for proportional piling, before and after proportional piling and matrix scoring methods.

3.3.4.1.1. Proportional piling

During proportional piling, informants used 100 counters (gravels) and they divided the gravels against the diseases or other various items. Informants did not count the gravels rather they simply piled the gravels by judging the relevant amount against the items. The proportional piling tool was used to quantify the means of livelihoods of communities and CAHWs, livestock keeping benefits, livestock keeping constraints and livestock composition.

Before and after proportional piling was used to quantify changes in means of livelihoods the communities and CAHWs, changes in livestock benefits, changes in livestock mortality and changes in general livestock diseases in different species of animals. During the scoring, totally 30 gravels were used. Subsequently, 10 gravels from 30 were used for 'before' situations and 1 to 20 gravels from 20 were added on 10 for 'after' situation for increased factors depending on the increment magnitude of the factor. The informants decreased from 10 gravels for 'after 'situation from 1 gravel to 10 gravels if the items were believed to be decreased and the informants left the scoring, as it was with 10 gravels for "after" situation for unchanged items.

3.3.4.1.2. Matrix scoring

Matrix scoring was used for veterinary service providers prevailed in the area. During the scoring, 5 gravels were used for each service provider or 25 gravels for each indicator. The informants allocated 25 gravels to 5 service providers from 0 to 25 scores for one service provider depending on the informants judgement what deserved for the specific service provider.

Individual interview was done on livestock keeping benefits, change on livestock keeping benefits, change on livestock mortality and animal health service providers with 150 individuals. Whereas, group discussion was done on means of livelihoods of the community and CAHWs, change on livelihoods of the community and CAHWs, livestock composition, livestock keeping constraints and change on livestock diseases with 20 groups (15 individuals per group). All the participatory methods that were used for this study and the indicators measured were illustrated in table 3.

Table 3. Indicators measured using PRA methods

Indicators measured	**Methods used**
Means of livelihoods of the communities &CAHWs	Proportional piling
Changes in livelihoods of the communities & CAHWs	Before and after proportional piling
Livestock compositions	Proportional piling
Livestock keeping benefits	Proportional piling
Livestock keeping constraints	Proportional piling
Changes of livestock benefits	Before and after proportional piling
Changes of livestock mortality	Before and after proportional piling
Changes of livestock diseases	Before and after proportional piling
Veterinary service providers	Matrix scoring

3.3.4.2. Laboratory test result

Giemsa staining and complement fixation test (CFT) to diagnose trypanosomosis and CBPP, respectively, were the methods used to see the CAHWs livestock disease diagnostic ability test agreement with that of laboratory test results.

3.4. Data analysis

Graphs, medians, tables and percentages analysis were performed by Microsoft Excel version 2000. Kendall's Coefficient of Concordance (W), medians and "p" values were analysed by the software SPSS (2002) version 11.5.0. Likewise, Kappa (agreement test) was analysed by Win Episcope 2.0 (1998). All statistical tools that were used in data analysis of this study with respective activities performed were shown in table 4.

Table 4. Statistical tools used for the study

Activities performed	**Statistical tools used**
Means of livelihoods of communities and CAHWs, changes in livelihoods of communities and CAHWs, livestock composition, livestock keeping constraints, livestock keeping benefits, changes on livestock benefits, changes in livestock mortality and changes on livestock diseases	Microsoft Excel 2000 (graphs, tables, medians and percentages).
Veterinary service providers and changes of livestock diseases	SPSS 11.5.0(2002) (W, medians, p values).
CAHWs livestock disease diagnostic ability test agreement with that of laboratory results	Win Episcope 2.0(1998) (Kappa)

W (Kendall's coefficient of concordance) ranges from 0 to 1. The higher the value of W, the higher the agreement amongst the informants.

Kappa ranges from 1(complete agreement) to 0 (agreement is equal to that expected by chance), whereas negative values indicate agreement less than is expected by chance. Arbitrary, benchmarks for evaluating observed Kappa values are: > 0.81(almost perfect agreement), 0.61-0.80(substantial agreement), 0.41-0.60(moderate agreement), 0.21-0.40(fair agreement), 0-0.20(slight agreement) and 0 (poor agreement)(Thrusfield, 1995).

4. RESULTS

4.1. Secondary data

4.1.1. Background information on CAH project

Ethiopian Catholic Church Social Development and Coordinating Office of Hararghe trained 89 CAHWs for the last three years (table 5). Among 89 trained CAHWs beginning, 85 were found currently active and 4 were found dropped out from their work.

Table 5. Number of CAHWs trained by ECC-SDCOH

Name of Woreda	Number of CAHWs trained per Woreda
Afdem	24
Meisso	14
Erer	9
Shinile	16
Aysha	7
Denbel	18
Anchar	1
Total	**89**

CAHWs training manual that was developed and utilized by HCS/ ECC-SDCOH comprised the following main points:

-introduction and healthy animal(characteristics and appearance, organ system and function) and basic clinical examination; history taking, restraining, complete physical and clinical examination;

-organ systems and their roles in disease naming and signs of diseases, and causes of diseases and principles of disease transmission; description of major diseases in Shinile zone(ranking disease problem per species, common infectious and parasitic diseases);

-description of different types of drugs(their use and dosage), clinical examination and selecting the correct drugs on the basis of symptoms(carry out clinical examinations, treatment procedures on the basis of signs, diseases control and prevention, and notifiable diseases),description of different veterinary techniques(castration, dehorning, hoof cutting, bloat treatment, wound treatment and care of utensils and medicines);

-practical field work on important veterinary techniques: drug administration (oral, injection, external application) and vaccination; and points on sustainable animal health programme.

Furthermore, HCS/ ECC-SDCOH gave refresher training to CAHWs with the following objectives:

-introduce additional diseases, drug/equipment and techniques that were not included in the first round training ;

-experience sharing among CAHWs and understand the extent of development of veterinary skills by CAHWs; and timely error correction if any at all and establish standard procedures to be followed by all the supervisors.

4.1.2. Activities of CAHWs

CAHWs vaccinated 383,550 heads of livestock from November 2002-August 2003 on regular and emergency activities (table 6).

Table 6. Number of livestock vaccinated by CAHWs by emergency campaign and regular activities

No	Activities	Species of treated animals				Total
1	Vaccination	Camel	Cattle	Shoat	Donkey	
1.1	Anthrax	67	52,805	191,230	0	244,102
1.2	Blackleg	0	35,898	0	0	35,898
1.3	Pasteurellosis	0	45,081	58,536	0	103,617
	Total	**67**	**133,784**	**249,766**	**0**	**383,550**

As indicated in table 7**,** CAHWs treated 373,537 heads of animals from November 2002-August 2003 on regular and emergency activities.

Table 7. Number of livestock treated by CAHWs by emergency campaign and regular activities

No.	Activities	Species of treated animals					
1	Treatment	Cattle	Camel	Sheep	Goat	Donk ey	Total
1.1	Infectious diseased	9,786	18,665	16,094	16,106	794	61,445
1.2	Internal parasites	30,231	12,245	35,008	31,972	621	110,077
1.3	External parasites	51,362	11,494	65,155	67,330	154	195,499
1.4	Wound treatment	74	635	20	42	17	788
1.5	Blood parasite	3,441	16	100	280	0	3,837
1.6	Deficiency	1,891	0	0	0	0	1,891
	Total	**96,785**	**43,059**	**116,377**	**115,730**	**1,586**	**373,537**

CAHWs also treated and vaccinated a total of 123050 heads of livestock during practical session of their training (table 8).

Table 8. Number of animals treated and vaccinated by trainees during practical session

Activities	Animal treated				
	Camel	Cattle	Sheep	Goat	Donkey
Wound treatment	516	61	7	20	84
Infectious disease treatment	778	1,097	1,029	1,113	111
Internal parasite treatment	3,116	7935	8,202	6,425	63
External parasite treatment	6,630	16,515	17,650	15,862	-
Vaccination (anthrax)	-	4,060	-	-	-
Vaccination (pasteurellosis)	-	13,125	11,090	7,561	-
Total	**11040**	**42793**	**37978**	**30981**	**258**

With the full assistance and involvement of HCS, CAHWs utilized veterinary drugs and equipment costing 613800.00 Birr from November 2002-August 2003 through emergency and cost recovery programme. CAHWs regularly reported their activities to HCS/ ECC-SDCOH. Their reporting system consisted of the following major points: problems

encountered and measures taken, major livestock disease encountered (treated, not treated), monthly drug utilization and cash collected, drugs (cost recovery, emergency), balance (initial kit start, drug value and cash at hand), utilization of other sources of drugs, documentation procedure and number of treated and vaccinated animals per species.

4.2. Means of livelihoods of the community

The main sources of livelihoods of the communities described by the informants were livestock rearing, crop farming, trading and others. Trading in the study area encompassed chat, illegal (contraband), live animal and milk and its milk product trading. Moreover, renting camels and donkeys for transporting goods, charcoal and fire wood for selling in the nearby towns, and income from being casual labourers in NGO and government construction projects were the other means of livelihood. As can be seen from figure 3, livestock rearing was found to be the main basis of their life contributing 73% of the total means of livelihoods. Crop farming that accounted for 17% stood second, while trading that accounted for 7% stood third and the remaining 3% of the total earning belonged to other minor things.

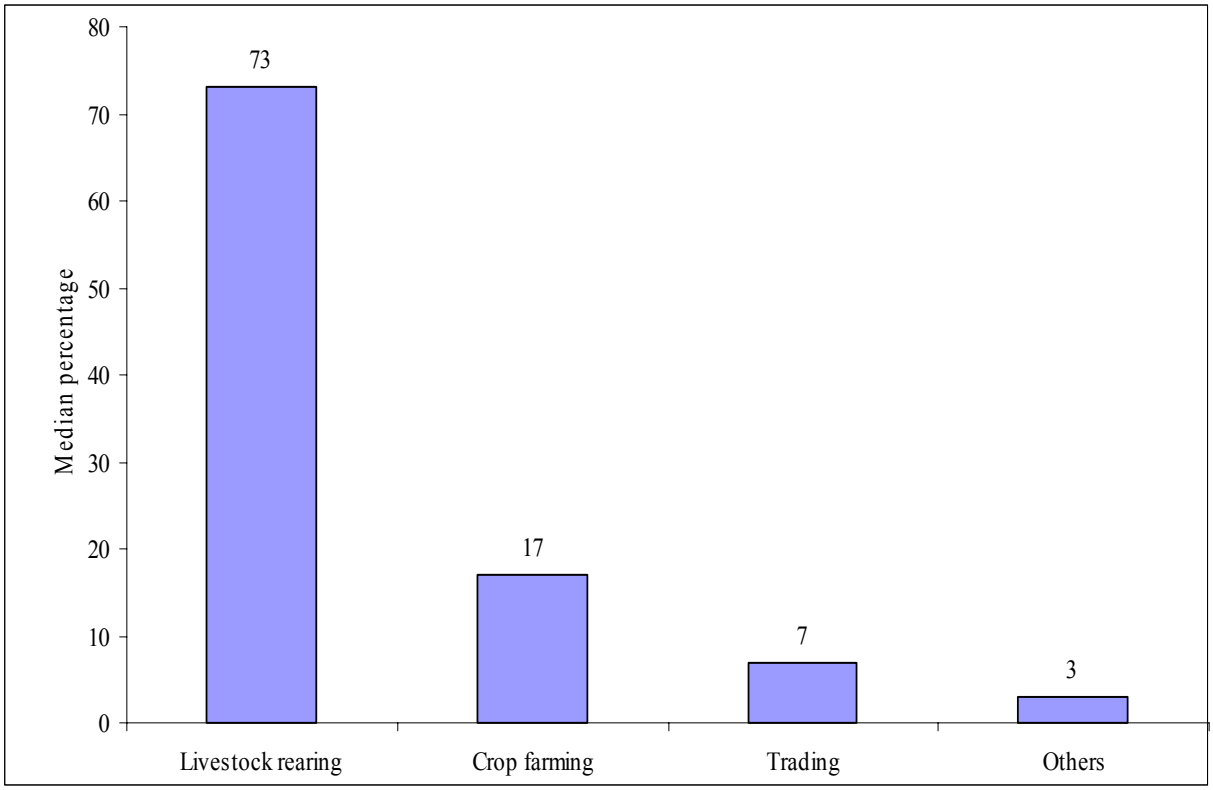

Figure 3. Means of livelihoods of the community both at CAH and non CAH intervention sites (n=20 groups/15 individuals per group)

CAHWs confirmed that livestock keeping, crop farming, service providing as CAHWs, trading and parent aid were their means of livelihoods.

As illustrated in figure 4, CAHWs revealed that 56% of their life was depended on livestock rearing, 5% on farming and 28% on service charge by giving animal health service to their communities. As per their views, trading covered 9% of their income source that indirectly depended on service charge. CAHWs described that they got a starter capital for trading from veterinary service charge to purchase emaciated and sick animals such as cattle, sheep and goats with cheap price. Then, they sold the animals with attractive price after deworming and treating. Their trading activity was entirely relying on their veterinary service charge income from the society. CAHWs also expressed that 2% of their means of livelihood was generated from their parents as traditional kin supports.

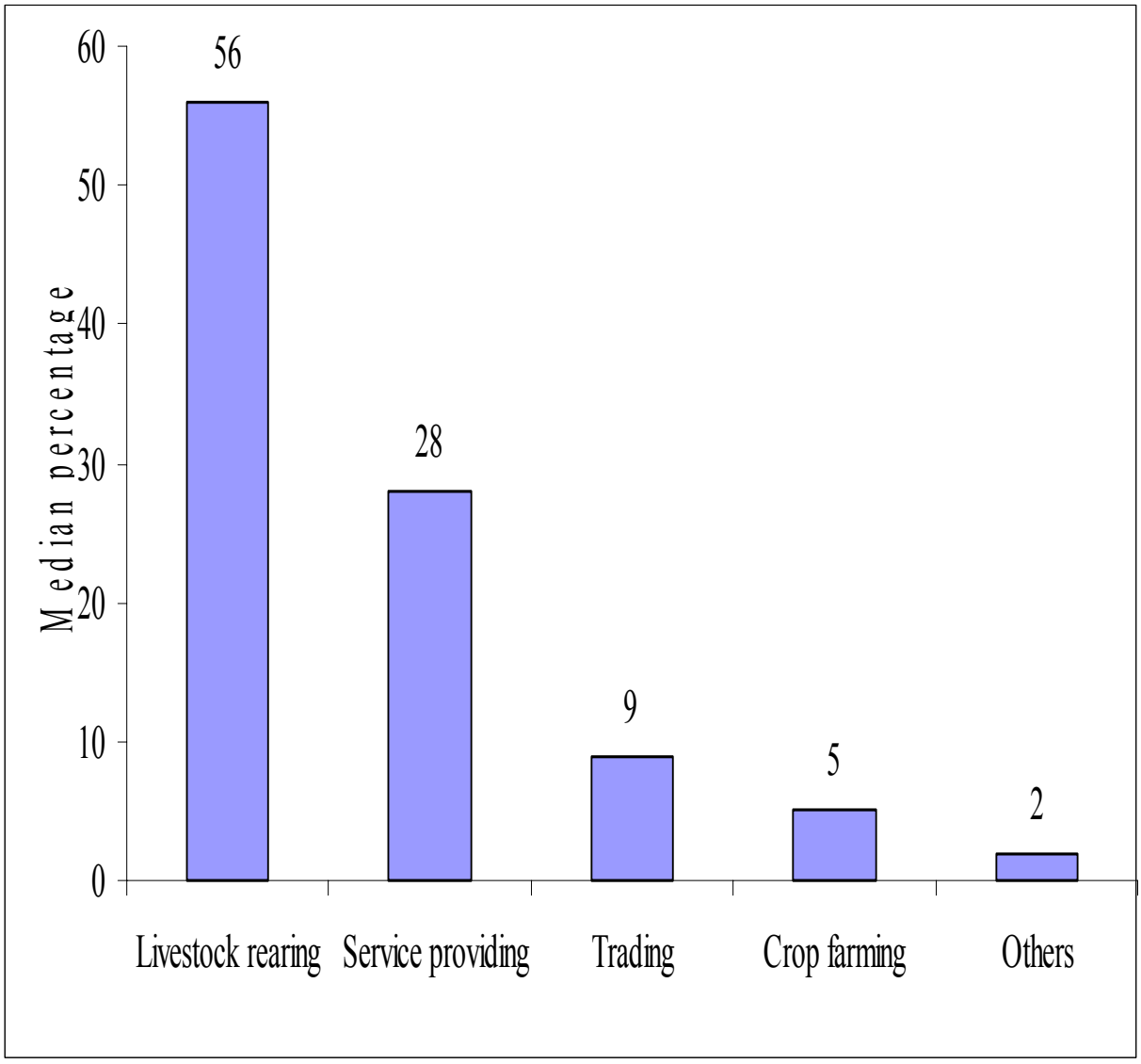

Figure 4. Means of livelihoods of CAHWs (n=10)

4.3. Changes on livelihoods of the community

The entire informants confirmed that CAH intervention programme contributed a lot to increase the livelihoods of the societies. As shown in figure 5, they stated that livestock rearing, crop farming, and trading were increased. Others (camel or donkey rent, fire wood or charcoal sell and casual labouring) remained unchanged for the last 3 years in CAH intervention sites.

Informants described that livestock rearing, crop farming and trading were decreased in non CAH intervention sites. But, other means of livelihoods (camel or donkey rent, fire wood or charcoal sell and casual labouring) were remained unchanged for the last 3 years in non CAH intervention sites.

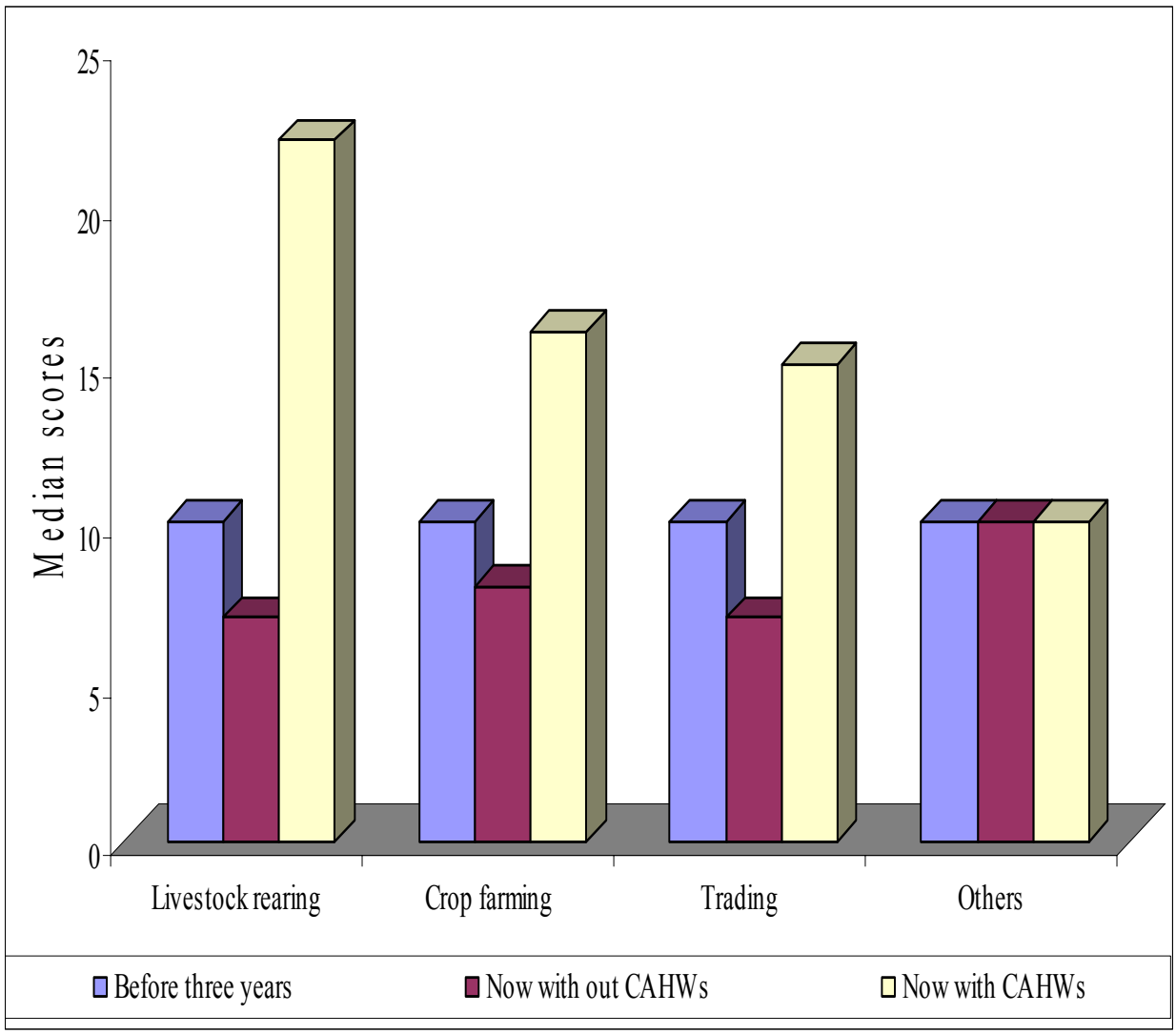

Figure 5. Changes on the livelihoods of the community (n=20 group/15 individuals per group, 10 group for each CAH and non CAH intervention sites)

CAHWs means of livelihood increased after they engaged as community animal health service providers. Both livestock rearing and trading were increased, whereas, crop farming was unchanged (figure 6).

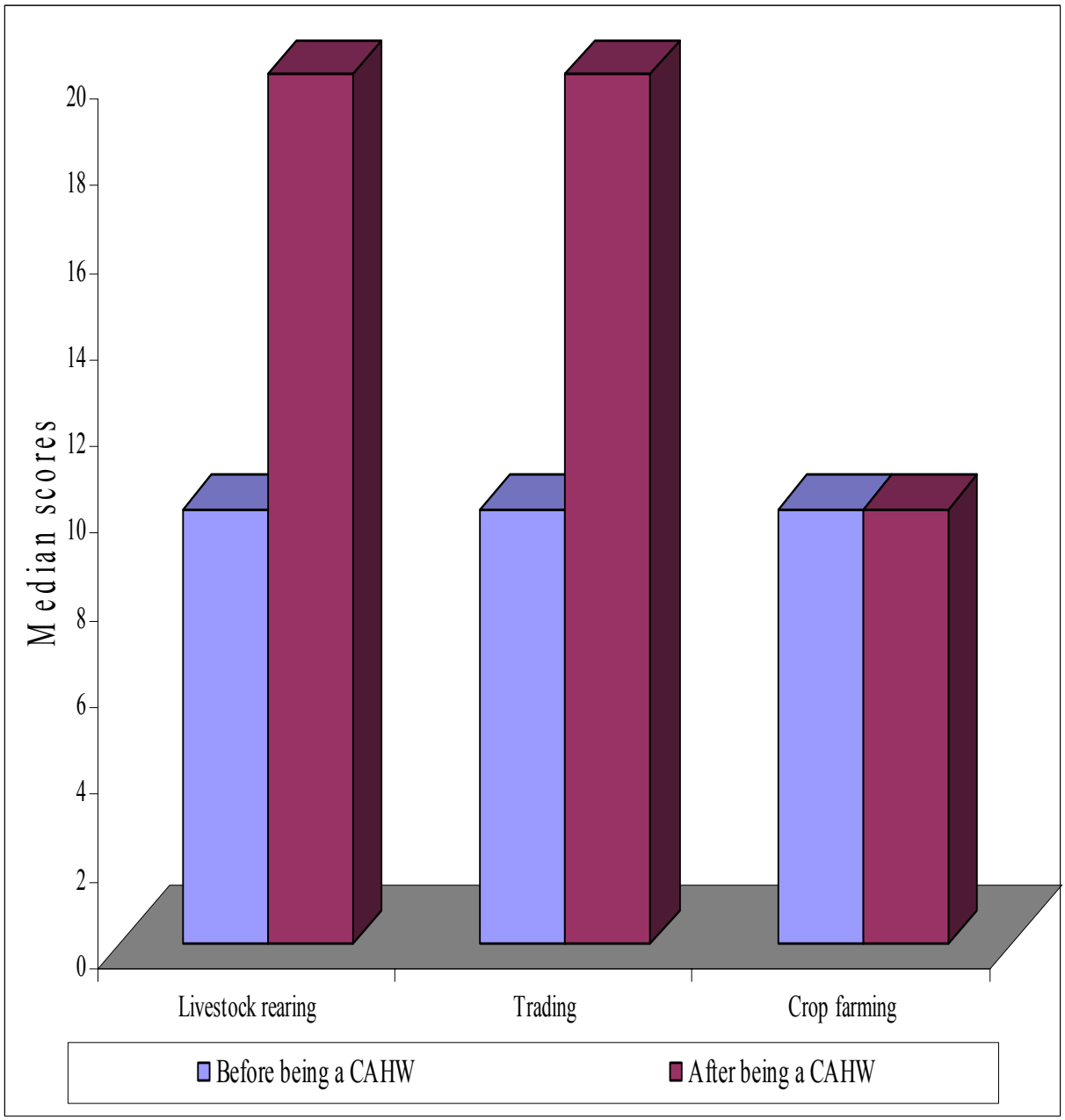

Figure 6. Change on livelihoods of CAHWs (n=10)

4.4. Livestock keeping constraints

Livestock diseases, drought/feed, predators and others (theft, lack of access to livestock market) were the major livestock keeping constraints identified by the community. As shown in figure 7, various livestock diseases were the leading livestock keeping problem accounted for 41% followed by drought/feed 35%. The remaining 16% was attributed to predators like lion, hyena, leopard and fox. Other constraints such as theft by the neighbouring clans as well

as lack of access to marketing for livestock and livestock product accounted for 8% of the general problem.

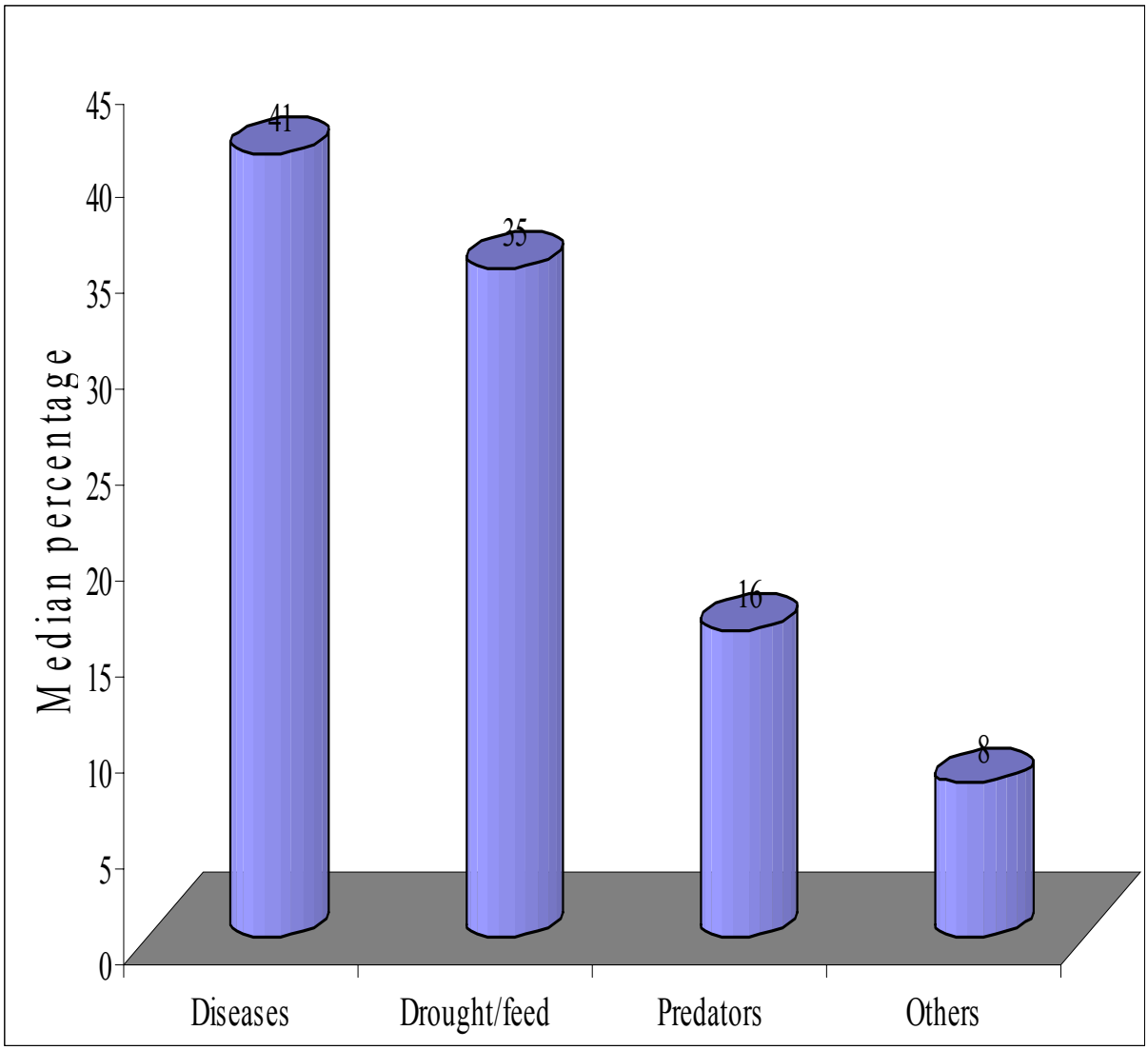

Figure 7. Livestock keeping constraints at both CAH and non CAH intervention sites (n=20 groups/15 individuals per group

4.5. Livestock composition

As can be seen from figure 8, the livestock composition identified was 31% cattle, 23% goats, 22% camels, 16% sheep and 8% donkeys.

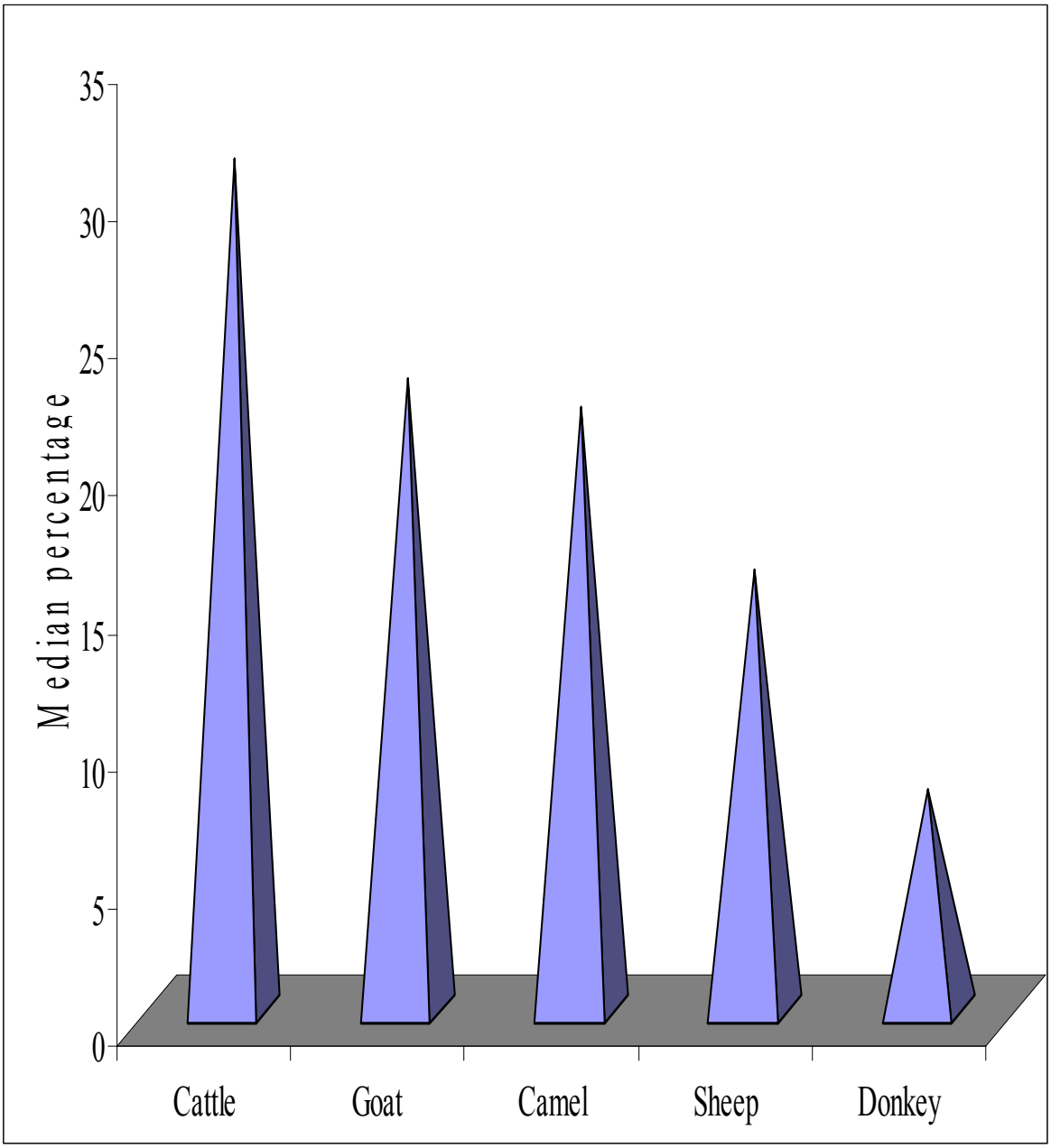

Figure 8. Livestock composition at both CAH and non CAH intervention sites (n=20 groups/15 individuals per group)

4.6. Purposes of keeping livestock

Informants confirmed that cash income (13% cattle, 16% sheep, 16% goat, 12% camel, 19% donkey), milk (23% cattle, 21% sheep, 23% goat, 27% camel), meat (7% cattle, 10% sheep, 10% goat, 7% camel), breeding to restore wealth (9% cattle, 10% sheep, 9% goat), prestige (33% cattle, 33% sheep, 32% goat, 35% camel, 20% donkey), ploughing (8% cattle only), transport (16% camel and 61% donkey) and other like hide, skin, gift, horn (7% cattle, 10% sheep, 10% goat, 3% camel) were the main livestock keeping benefits. Figure 9 shows the

purposes why the community keep different livestock species and the relative importance of each livestock species for specific benefit.

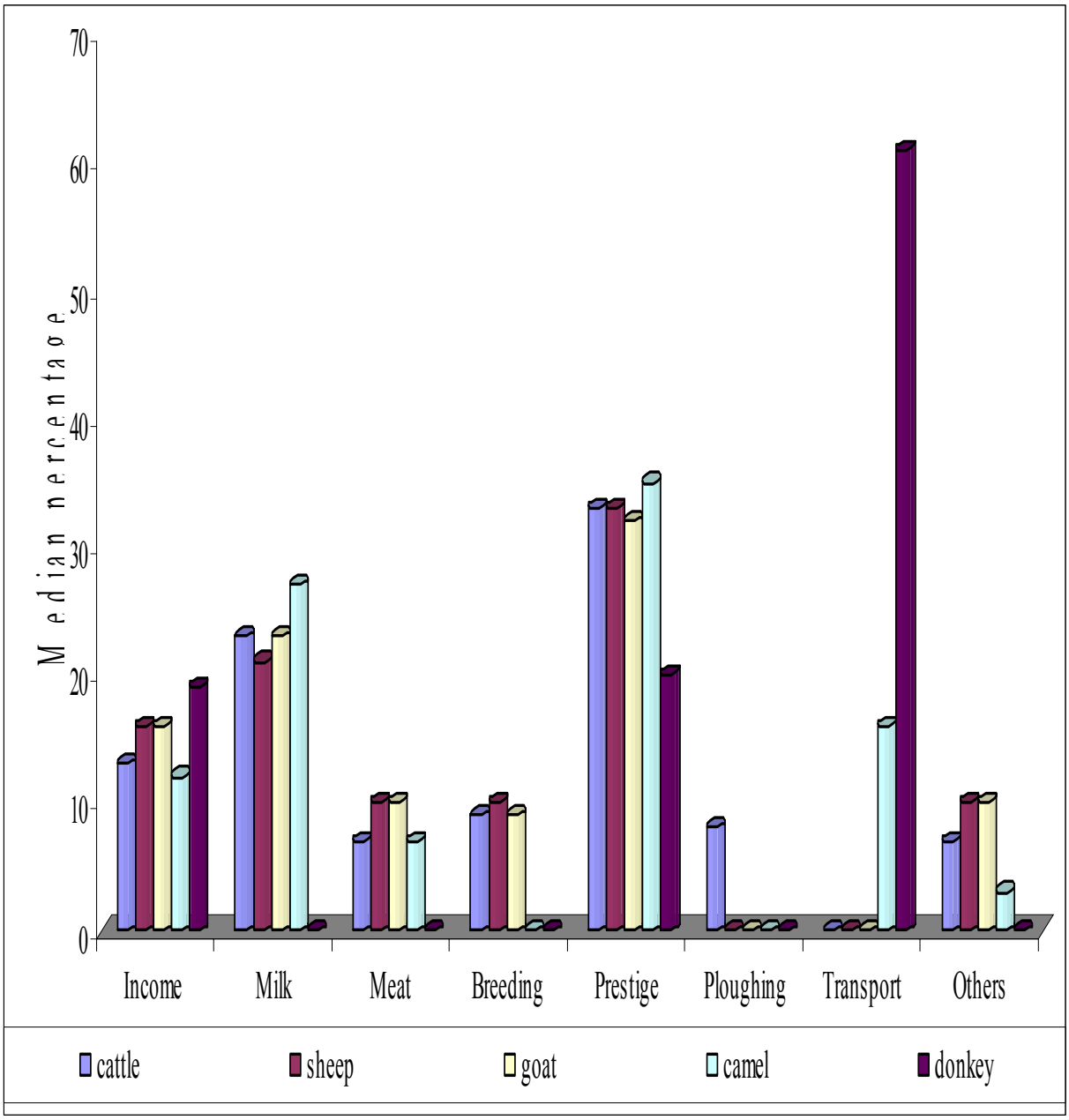

Figure 9. Purpose of keeping livestock at both CAH and non CAH intervention site(n=300 individuals)

4.7. Changes on livestock keeping benefits

The community stated that cash income from selling of animals, milk, meat, wealth restoring, transportation, draught power, prestige and other benefits of livestock keeping were decreased at non CAH intervention sites for the last 3 years (figure 10). Cash income from selling of animals, milk, meat, wealth restoring, transportation, draught power, prestige and other

benefits of livestock keeping were increased at CAH intervention sites for the last 3 year (figure 10).

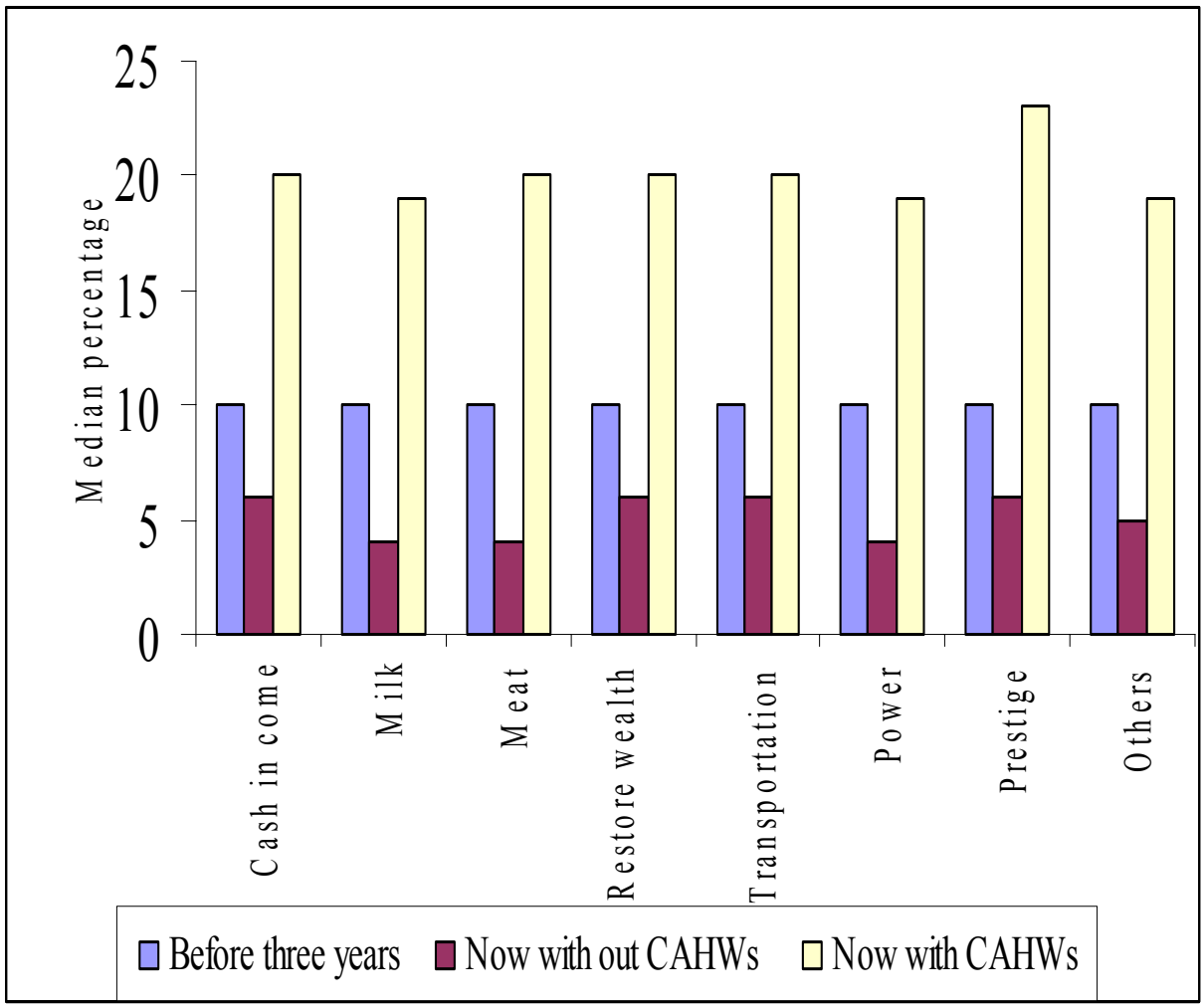

Figure 10. Changes on livestock keeping benefits at both CAH and non CAH intervention sites (n=300 individuals)

4.8. Veterinary service providers

All informants agreed that CAHWs, traditional healers and public services were sources of veterinary service providers for the community in CAH intervention sites (table 9). Public veterinary service, illegal drug dealers (black-market)/herder treatment and traditional healers were the main sources of veterinary service providers in non CAH intervention sites (table 10).

Table 9. Veterinary service providers using matrix scoring in CAH intervention sites (n=150 individuals)

Indicators	Government veterinary service	Illegal drug dealers/ Black-market and herder service	Traditional medicine	CAHWs	Others
Service is near to us so our animals are treated quickly (W=0.932, p<0.05)	• 1(0-5)	0(0-3)	•••• 4(2-8)	•••••••••• •••••••••• 20(14-28)	0(0-0)
Service always has medicine (W=0.901, p<0.05)	•• 2(0-7)	0(0-3)	••• 3(1-8)	•••••••••• •••••••••• 20(14-23)	0(0-0)
The quality of medicine is good (W=0.905, p<0.05)	•• 2(0-10)	0(0-2)	••• 3(0-6)	•••••••••• •••••••••• 20(12-24)	0(0-0)
Our animals are usually recovered if we use this service (W=0.893, p<0.05)	••• 3(0-10)	0(0-3)	••• 3(0-8)	•••••••••• ••••••••• 19(11-23)	0(0-0)
We get good advice from the service providers (W=0.928, p<0.05)	• 1(0-4)	0(0-1)	•••• 4(1-11)	•••••••••• •••••••••• 20(14-24)	0(0-0)
This service can treat all our animal health problems (W=0.886, p<0.05)	• 1(0-10)	0(0-2)	•••• 4(0-9)	•••••••••• •••••••••• 20(10-24)	0(0-0)
The service is affordable (W=0.909, p<0.05)	• 1(0-7)	0(0-2)	•••• 4(1-7)	•••••••••• •••••••••• 20(12-23)	0(0-0)
We trust this service provider (W=0.923, p<0.05)	• 1(0-4)	0(0-2)	•••• 4(1-9)	•••••••••• •••••••••• 20(16-24)	0(0-0)
The community support this service (W=0.909, p<0.05)	• 1(0-11)	0(0-2)	••• 3(1-6)	•••••••••• ••••••••••• 21(10-25)	0(0-0)
Change in this service provider from 10 (W=0.923, p<0.05)	2(0-10)	0(0-3)	3(1-5)	0(0-0)	0(0-0)

W = Kendall's Coefficient of Concordance. W values vary from 0 to 1; the higher the value, the higher the level of agreement between informants. Median values (ranges) are presented. The black dots represent the scores (number of small gravels) that were used during the matrix scoring; a higher number of dots indicate a relatively strong association between an indicator and service providers.

Table 10. Veterinary service providers using matrix scoring in non CAH intervention sites (n=150 individuals)

Indicators	Government veterinary service	Illegal drug dealers/ Black-market and herder service	Traditional medicine	Others
Service is near to us so our animals are treated quickly (W=0.982, p<0.05)	●● 2(0-4)	●●●●●●●● ●●●●●●●●● 17(10-22)	●●●●●● 6(2-12)	0(0-0)
Service always has medicine (W=0.954, p<0.05)	●●●● 4(0-10)	●●●●●●●● ●●●●●●●● 16(4-22)	●●●●● 5(1-10)	0(0-0)
The quality of medicine is good (W=0.924, p<0.05)	●●●●●● 6(0-14)	●●●●●●●● ●●●●●●●● 16(0-20)	●●● 3(1-14)	0(0-0)
Our animals are usually recovered if we use this service (W=0.911, p<0.05)	●●●●●●●● 8(0-17)	●●●●●●● ●●●●●● 13(4-22)	●●●● 4(0-9)	0(0-0)
We get good advice from the service providers (W=0.980, p<0.05)	●● 2(0-6)	●●●●●●●●● ●●●●●●●●● 18(8-22)	●●●●● 5(2-15)	0(0-0)
This service can treat all our animal health problems (W=0.927, p<0.05)	●●●● 4(0-11)	●●●●●●●● ●●●●●●●● 16(7-24)	●●●●● 5(0-15)	0(0-0)
The service is affordable (W=0.914, p<0.05)	●●●●● 5(0-15)	●●●●●●●● ●●●●●●● 15(5-22)	●●●●● 5(2-18)	0(0-0)
We trust this service provider (W=0.980, p<0.05)	●● 2(0-4)	●●●●●●●●● ●●●●●●●●● 18(9-22)	●●●●● 5(2-15)	0(0-0)
The community support this service (W=0.568, p<0.05)	●●●●●●●● 8(0-22)	●●●●●●●●●●● 11(0-23)	●●●●●● 6(0-14)	0(0-0)
Change in this service provider from 10 (W=0.904, p<0.05)	-7(0-10)	17(-5-12)	7(3-5)	0(0-0)

W = Kendall's Coefficient of Concordance. W values vary from 0 to 1; the higher the value, the higher the level of agreement between informants. Median values and ranges of the scoring are presented. The black dots represent the scores (number of small gravels) that were used during the matrix scoring; a higher number of dots indicate a relatively strong association between an indicator and service providers.

The communities revealed that CAHWs were the most preferable and common veterinary service providers in CAH intervention sites. CAHWs played roles in prevention of livestock diseases by giving advice to the communities on how to vaccinate their animals, bury (burn) dead animals, isolate sick animals (herds) from healthy, reduce contact of different herds, protect (maintain) pasture and forest, generate other sources of livelihood besides livestock

rearing, bring sick animals to CAHWs for treatment, report livestock diseases soon, not to treat their animals by themselves and not to use unknown source, improperly handled and outdated drugs from black market. Illegal drug dealers (black market) and herders service were found to be the only means of veterinary service providers in non CAH intervention areas (table 10 and figure 11).

As per the observation of the informants, each of public government veterinary service and traditional veterinary service were reduced by 70% but, black market and herders veterinary services increased by 70% for the last 3 years in non CAH intervention sites. In comparison, 80% public service, 100% illegal drug dealers (black market, herder treatments) and 70% traditional healers were decreased for the last three years in CAH intervention sites.

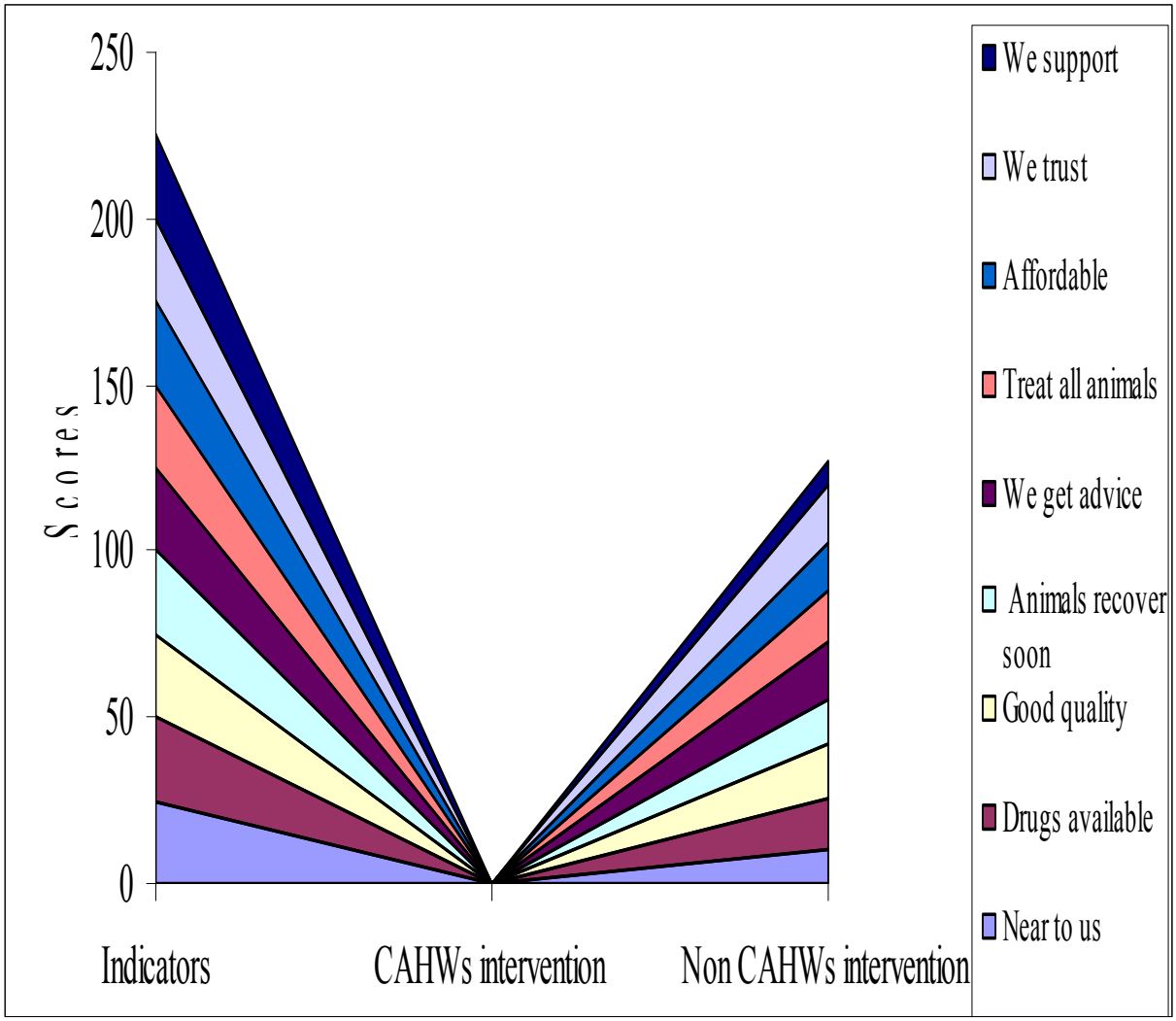

Figure 11. Black-market and herder treatment services(n=300 individuals)

4.9. Changes on livestock mortality

As shown in figure 12, the community described that mortality of cattle, sheep, goat, camel and donkey were decreased in CAH intervention sites for the last 3 years. In comparison, mortality of cattle, sheep, goat and camel were increased, whereas, mortality of donkey was unchanged for the last 3 years in non CAH intervention sites.

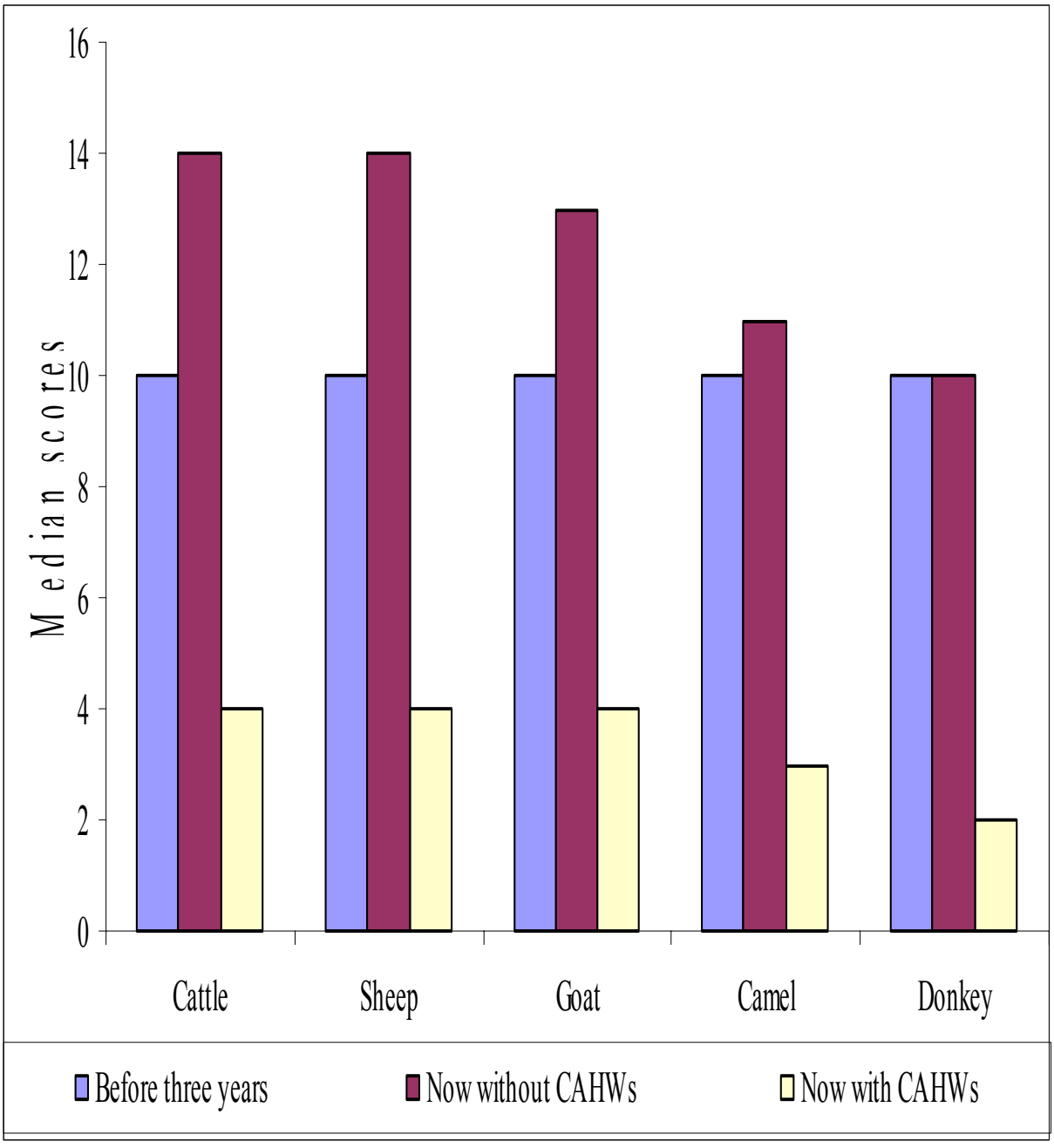

Figure 12. Changes on livestock mortality at both CAH and non CAH intervention sites (n=300 individuals)

4.10. Changes on livestock diseases

4.10.1. Cattle diseases

Figure 13. Herd of cattle watering in deep well around Afdem

Most cattle disease incidences that were treated by CAHWs were significantly decreased for the last three years in CAH intervention areas. Consequently, there was a strong agreement that dhigis (black leg), boqta (pasteurellosis), cashi (helminthosis), dhawa (wound), haran (anthrax), sombob (CBPP), shillin (tick infestation), gofle (mastitis), sogudud (babesiosis) and ampbaar (mange) were decreased ($W=0.609$, $p<0.05$).

There was a significant agreement among informants that dhigis (black leg), cashi (helminthosis), dhawa (wound), burbur (LSD), dheberjebiye (botulism), sombob (CBPP), shillin (tick infestation), gofle (mastitis), sogudud (babesiosis) and ampbaar (mange) were increased in cattle in non CAH intervention sites ($W=0.505$, $p<0.05$).

Boqta (pasteurellosis), haran (anthrax) and cabeb (FMD) were cattle diseases that did not show any change for the last 3 years in non CAH intervention sites ($W=0.505$, $p<0.05$).

All cattle diseases that were identified by the informants and their changes of magnitude for the last 3 years in both CAH intervention and non- CAH intervention sites were illustrated in figure 14 and 15.

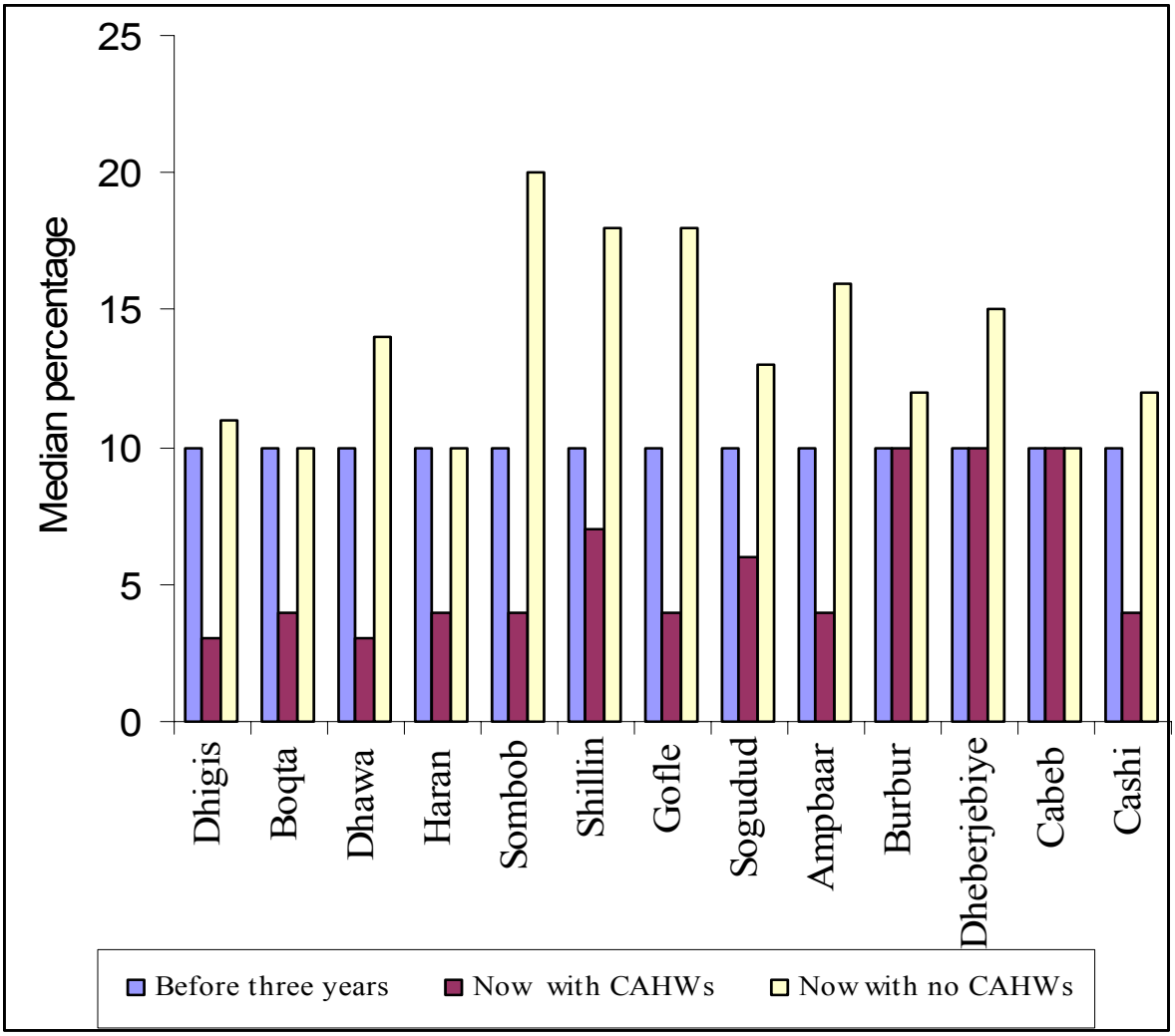

Figure 14. Changes on cattle diseases that were managed by CAHWs (n=20 groups/15 individual per group, W=0.609, $p<0.05$ at CAH intervention and W=0.505, $p<0.05$ at non CAH intervention sites).

Cattle diseases that were not managed by CAHWs such as burbur (LSD), dheberjebiye (botulism) and cabeb (FMD) were remained static as before 3 years in CAH intervention areas (W=0.609, $p<0.05$).

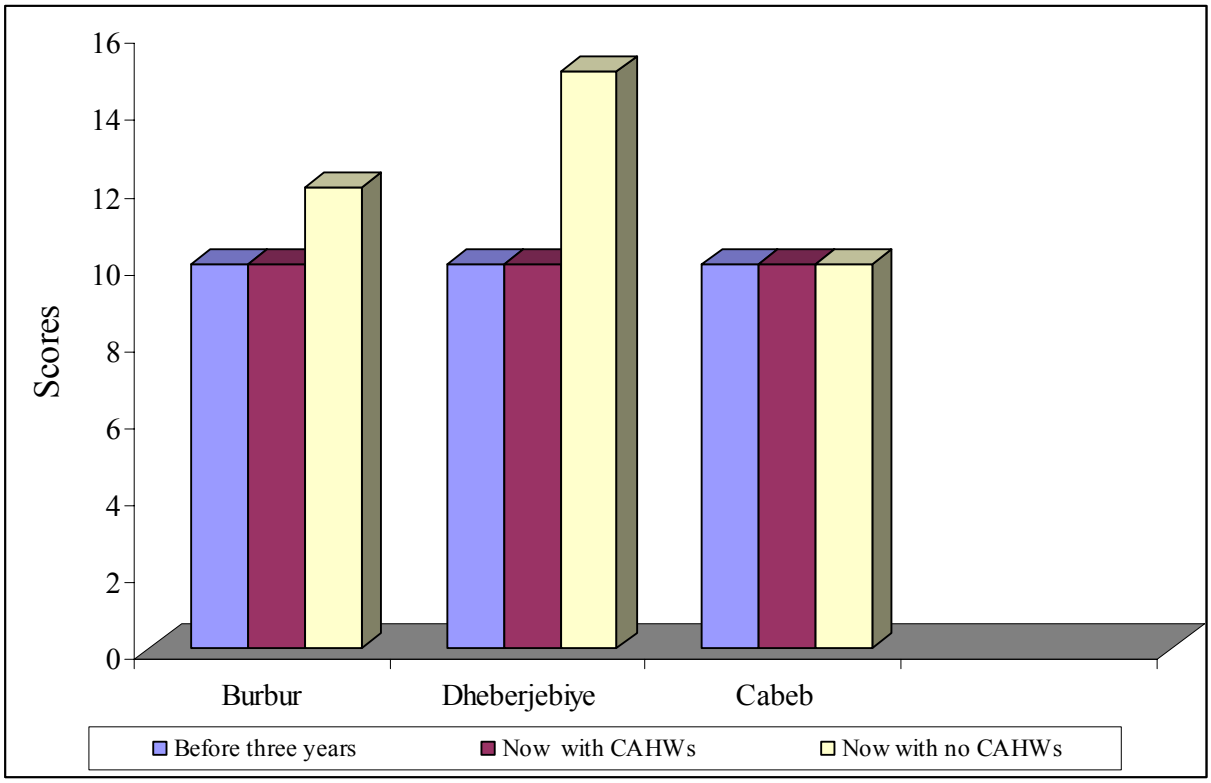

Figure 15. Changes on cattle diseases that were not managed by CAHWs (n=20 groups/15 individual per group, W=0.609, $p<0.05$ at CAH intervention and W=0.505, $p<0.05$ at non CAH intervention sites).

4.10.2. Sheep and goat diseases

Figure 16. Flock of sheep and goats around the residence of Afase

There was significant agreement among informants that most sheep and goat diseases that were handled by CAHWs like sombob (CCPP), cashi (helminthosis), ampbaar (mange), boqta (pasteurellosis), shillin (tick infestation), dhawa (wound) and haran (anthrax), were decreased in CAH intervention sites. They also agreed that jenweren (respiratory diseases complex) was increased and gedanod (sheep and goat pox) existed as it was 3 years ago in CAH intervention sites ($W=0.575$, $p<0.05$). Whereas, sheep and goat diseases, namely; sombob (CCPP), cashi (helminthosis), ampbaar (mange), boqta (pasteurellosis), gedanod (sheep and goat pox), shillin (tick infestation), dhawa (wound) and jenweren (respiratory disease complex) were increased for the last 3 years in non CAH intervention sites. Haran (anthrax) did not show any change in non CAH intervention sites for the last 3 years ($W=0.155$, $p>0.05$). There was a poor agreement among the informants concerning on the changes of sheep and goat diseases in non CAH intervention sites.

Change in incidence of the sheep and goat diseases for the last 3 years in both CAH intervention and non CAH intervention sites was indicated in figure 17.

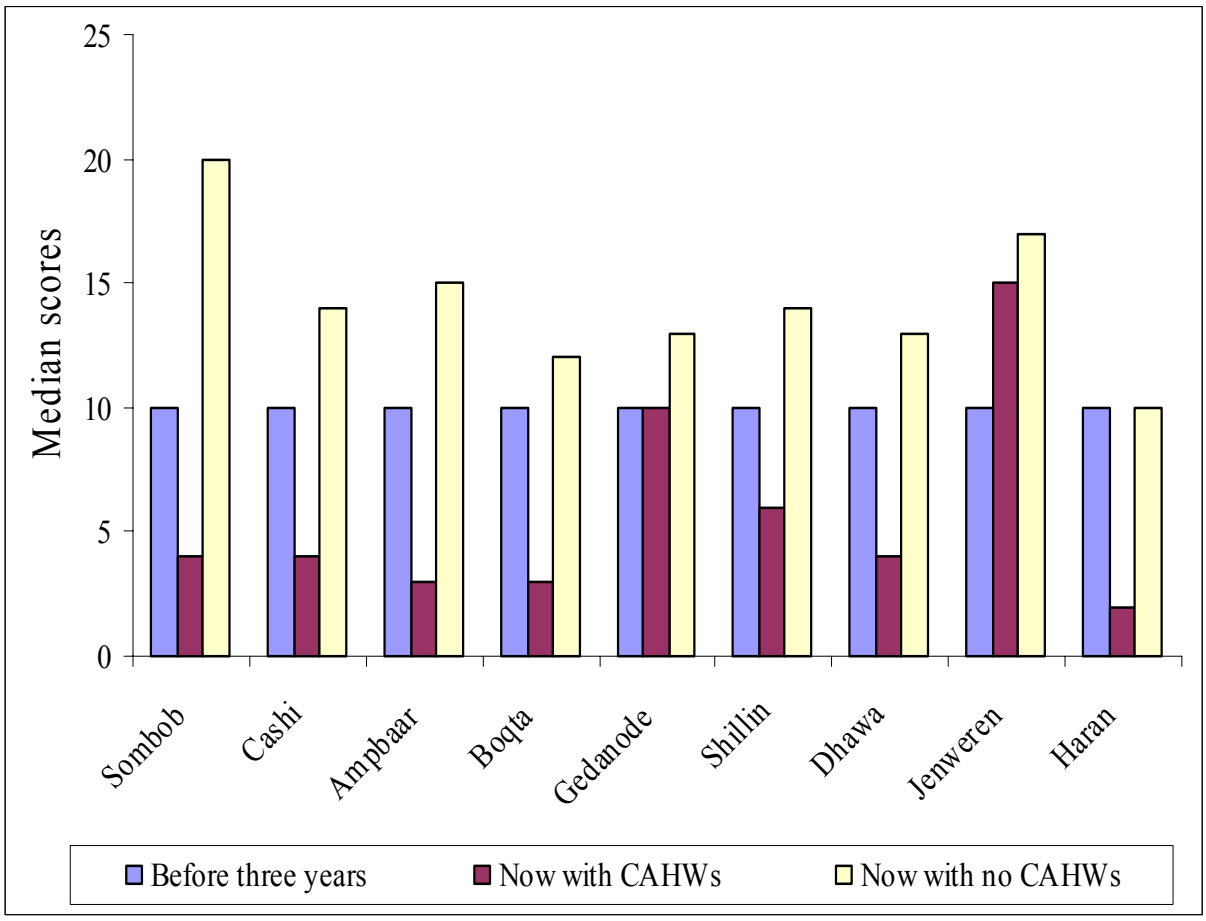

Figure 17. Changes on sheep and goat diseases (n=20 groups/15 individuals per group, $W=0.575$, $p<0.05$ at CAH inrervention sites and $W=0.155$, $p>0.05$ at non CAH intervention sites)

4.10.3. Camel diseases

Figure 18. Herd of camels browsing on roadsides of Gedugaz

The communities were significantly agreed that most camel diseases such as ampbaar (mange), haran (anthrax), cashi (anthrax), mellig (trypanosomosis), shillin (tick infestation), dhugato (pneumonia), sinade (respiratory disease complex) and dhawa (wound) were decreased at CAH intervention sites for the last three years ($W=0.712$, $p<0.05$).

Ampbaar (mange), mellig (trypanosomosis), shillin (tick infestation), dhugato (pneumonia), dhawa (wound) and shimbir (paralysis) were increased and haran (anthrax), cashi (helminthosis), furq (camel pox) and sinade (respiratory disease complex) were yet unchanged on camels for the last three years in non CAH sites ($W=0.302$, $p<0.05$). Changes on camel diseases that were treated by CAHWs were indicated in figure 19.

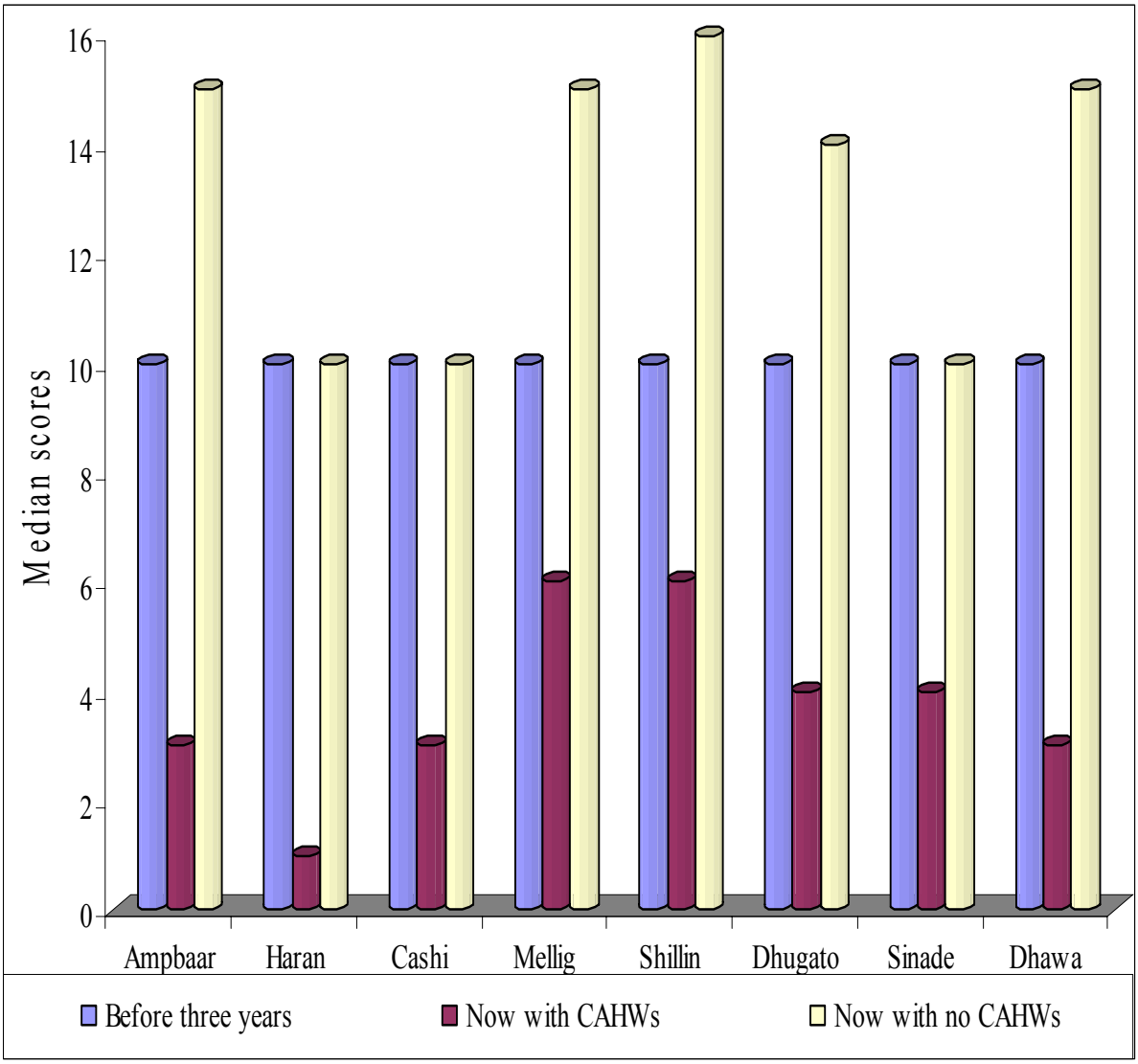

Figure 19. Change on camel diseases that were managed by CAHWs (n=20 groups/15 individuals per group, W=0.712, $p<0.05$ at CAH intervention sites and W=0.302, $p<0.05$ at non CAH intervention sites)

Furq (camel pox) and shimbir (paralysis), which were not treated by CAHWs, were remained unchanged in CAH intervention sites (W=0.712, $p<0.05$) as indicated in figure 20.

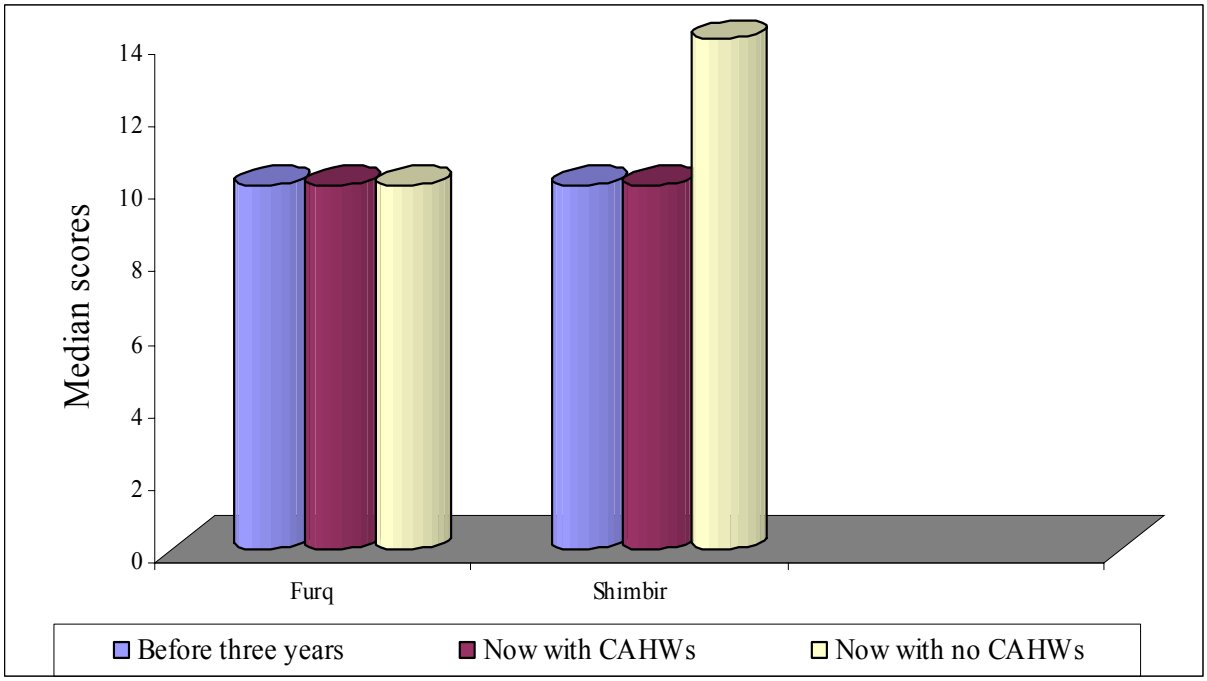

Figure 20. Changes on camel diseases that were not managed by CAHWs (n=20 groups/15 individuals per group, W=0.712, $p<0.05$ at CAH intervention sites and W=0.302, $p<0.05$ at non CAH intervention sites)

4.10.4. Donkey diseases

Figure 21. Herd of donkeys grazing at Afase area

Informants confirmed that donkey diseases such as cashi (helminthosis), quffa (coughing), mellig (trypanosomosis), dhawa (wound), bejho (trypanosoma equiperdum) and sogudud (babesiosis) were decreased in CAH intervention areas (W=0.206, p>0.05).

Cashi (helminthosis), quffa (coughing), dhawa (wound), bejho (trypanosoma equiperdum) and sogudud (babesiosis) were existed similar to as they were before three years but mellig (trypanosomosis) and dhawa (wound) were increased in non CAH intervention sites (W=0.408, p<0.05)(figure 22).

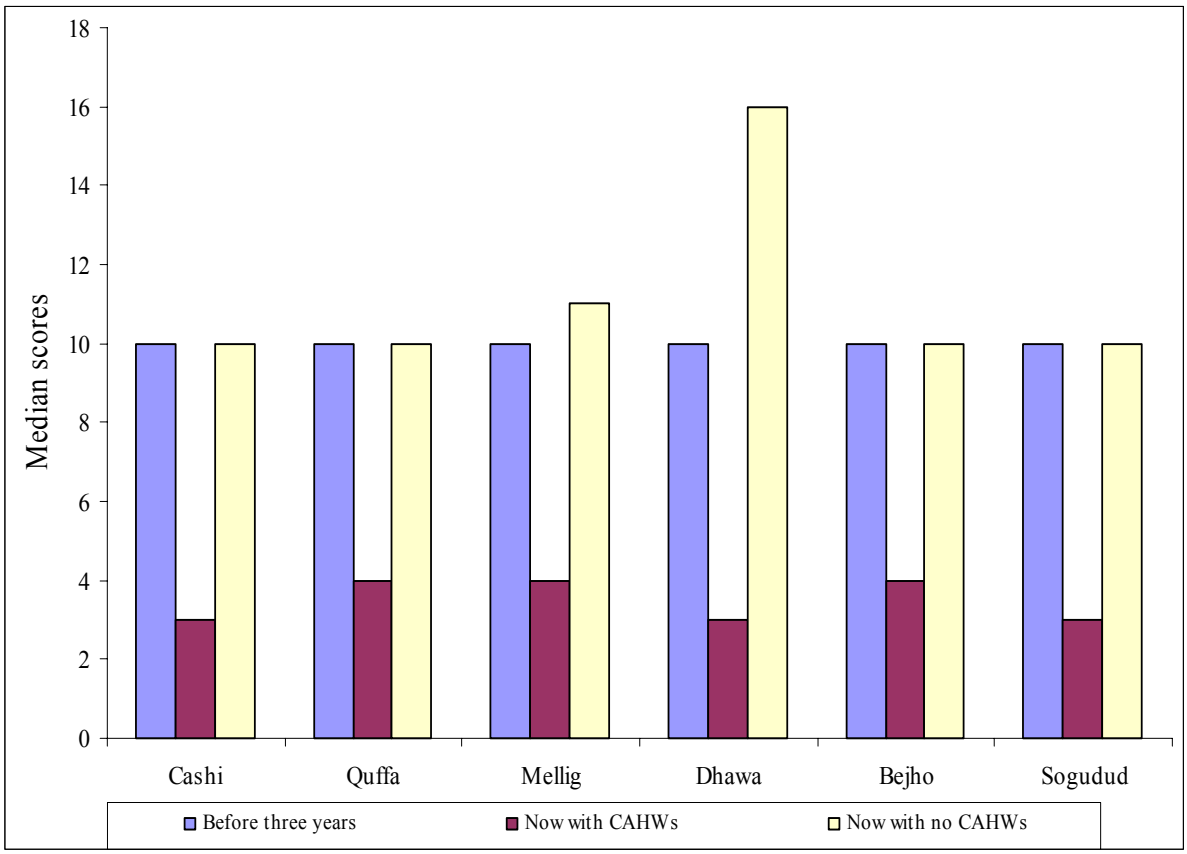

Figure 22. Change on donkey diseases (n=20 groups/15 individuals per group, W=0.206, p>0.05 at CAH intervention sites and W=0.408, p<0.05 at non CAH intervention sites)

4.11. CAHWs livestock disease diagnosis ability test agreement with modern laboratory test

Figure 23. CAHWs in action at Biyokulo and Mulu

Among 41 animals that were suspected by the CAHWs for sombob (CBPP) and mellig (trypanosomosis), 25 were found positive) by laboratory tests (table 11). Whereas, from 60 animals that were supposed to be free from sombob (CBPP) and mellig (trypanosomosis) by CAHWs diagnosis, all were found negative by laboratory tests (table 11).

Figure 24. A cow that was identified by CAHWs suffering from sombob (CBPP) and finally confirmed at laboratory by CFT.

Table 11. Laboratory test results based on CAHWs diagnosis for sombob (CBPP) and mellig (trypanosomosis) sick and free animals

Species of animals	**Suspected diseases**	**No. of sample**	**Technique**	**Positive result**
Cattle	CBPP	19(20)	CFT	12(0)
Cattle	Trypanosomosis	12(25)	Giemsa	7(0)
Camel	Trypanosomosis	10(15)	Giemsa	6(0)
Total		**41(60)**		**25(0)**

Numbers in the parenthesis represent animals free of mellig (trypanosomosis) and sombob (CBPP).

CAHWS livestock disease test agreement (kappa) showed 0.654 for mellig (trypanosomosis) in cattle that indicated strong/substantial agreement with modern laboratory tests (table 12). Positive predictive value and negative predictive value of CAHWs diagnosis for mellig (trypanosomosis) in cattle was found 58.33% and 100.00%, respectively (table 12).

Table 12. CAHWs livestock disease diagnosis ability test agreement with laboratory test results for the diagnosis of mellig (trypanosomosis) in cattle (Kappa=0.654, PPV=58.33%, NPV=100.00%)

		Laboratory test results		**Total**
		Positive	**Negative**	
CAHWs Diagnosis	Positive	7	5	12
	Negative	0	25	25)
Total		**7**	**30**	**37**

CAHWS livestock disease test agreement (kappa) showed 0.643 for mellig (trypanosomosis) in camel that indicated strong/substantial agreement with modern laboratory tests (table 13). Positive predictive value and negative predictive value of CAHWs diagnosis for mellig (trypanosomosis) in cattle was found 60.00% and 100.00%, respectively (table 13).

Table 13. CAHWs livestock disease diagnosis ability test agreement with laboratory test results for the diagnosis of mellig (trypanosomosis) in camel (Kappa=0.643, PPV=60.00%, NPV=100.00%)

		Laboratory test results		**Total**
		Positive	**Negative**	
CAHWs Diagnosis	Positive	6	4	10
	Negative	0	15	15
Total		**6**	**19**	**25**

CAHWs livestock disease test agreement (kappa) showed 0.637 for sombob (CBPP) in cattle that indicated strong/substantial agreement with modern laboratory tests (table 14). Positive predictive value and negative predictive value of CAHWs diagnosis for sombob (CBPP) in cattle was found 63.12% and 100.00%, respectively (table 14).

Table 14. CAHWs livestock disease diagnosis ability test agreement with laboratory test results for the diagnosis of sombob (CBPP) in cattle (Kappa=0.637, PPV=63.12%, NPV=100.00%)

		Laboratory test results		**Total**
		Positive	**Negative**	
CAHWs Diagnosis	Positive	12	7	19
	Negative	0	20	20
Total		**12**	**27**	**39**

4.12. Strength, weakness, opportunity and threat of CAH service delivery system in Shinile zone, SNRS

Shinile zone veterinary service coordinators, AHA, AHT and CAHWs described the strength, weakness, opportunity and threats of community-based animal health service delivery system conducted in the zone as shown in table 15.

Table 15. Strength, weakness, opportunity and threat of CAH service delivery system in Shinile zone, SNRS

Strength	• CAH service delivery system was established in the remotest and marginalized areas of the zone • training was given for 89 CAHWs • millions of livestock were treated and vaccinated through the involvement of CAHWs by regular and campaign works • training and refresher training manuals were prepared • involvement of government line department during selection, training and monitoring • establishment of cost recovery system
Weakness	• record keeping of the CAHWs was not reliable • delaying of refresher training and irregularity in monitoring and supervision • there was no regular supply of drugs and equipment • there was no establishment and legalization of CAHWs association • there was no dependable private veterinary drugs and equipment suppliers/shops linkage with CAHWs • women CAHWs were not trained
Opportunities	• HCS was highly interested to expand and make sustainable its CAH service delivery system • public veterinary service was unthinkable in most areas of the zone since the areas were marginalized, remote and pastoral nature of the communities. For that reason, community-based animal health delivery was the only alternative to give the service for the needy people • the communities supported the program • government and the NGO encouraged the program
Threat	• free drug distribution by the government and NGOs during emergency campaign with out clearly demarcating the roles and benefits of CAHWs during the campaign. • unknown quality and source of drugs were available in most areas of the zone although the communities in CAH intervention sites refused to use it • frequent occurrence of drought in the zone

5. DISCUSSION

In the present study, livestock rearing, crop farming, trading and others are means of livelihoods of the communities identified by the informants. Livestock rearing is incomparably the leading means of livelihood of the society. While, trading in the area encompasses chat, illegal (contraband) items, live animals, and milk and milk products. Other means of livelihoods indicated by the communities are renting of camels and donkeys for goods transportation, charcoal and firewood selling in the nearby towns, and income from casual employment as daily labourers in NGO and government construction projects.

This study shows that livestock rearing, crop farming and trading have been increased considerably, while other means of livelihoods are unchanged in CAH intervention sites for the last three years. Thus, CAH intervention programme is contributing a significant increment on the livelihoods of the societies as has been reported earlier by NPIACT (2002). The reasons are: the cash income from sales of livestock has increased around two folds; the quantity of meat obtained from individual animals has increased; milk production and cash income from milk sales have increased and in agro-pastoralist communities, the use of draught animal power has increased. On the other hand, informants of the present study confirmed that livestock rearing, crop farming and trading have decreased while others means of livelihoods have remained unchanged in non CAH intervention sites for the last three years.

From the present livestock rearing in CAH intervention sites has increased highly since their animals got veterinary service soon after and before infections and the herders got advice for appropriate measures. Thus, the death of both young and old animals has dramatically decreased in the CAH intervention area. This study agrees with the report of EPIAT (2002) in that the number of cattle increased from 33% to 67% and camel 5% to 95% after CAH intervention programme.

The present study reveals that livestock benefits such as cash income from selling of animals, milk, meat, wealth restoring, transportation, draught power; prestige and others (hide, skin, horn, gift to relatives) have decreased in non CAH intervention sites. In contrast, cash income from selling of animals, milk, meat, wealth restoring, transportation, draught power, prestige and others (hide, skin, horn, gift to relatives) benefits of livestock have increased with

considerable amount in CAH intervention sites as has been reported earlier by EPIAT (2002). This study shows that CAHWs have played role to increase animal products and livestock market value. Moreover, the incidence of livestock diseases treated by CAHWs are reduced and as the result, milk and meat production have increased. Improved livestock management including regular disease treatment and diseases prevention have increased productivity of both cattle and goats (EPIAT, 2000; CARD, 1989). And milk product is increased and also sold to meet some of the family income after CAH intervention (Mogga, 2001). According to this study, milk and milk products have increased in CAH intervention sites, which in turn has made an increment of trading of milk and butter by women and children. Nalitolela and Allport (2002) showed increased milk availability after CAH project implementation. Similarly, EPIAT (2000) noticed that milk product was increased by 50% and 57% in Amibara and Gewane Woredas, respectively, in Afar regional state of Ethiopia. The direct impact of CAHWs services on the welfare of the communities has been considered to be the positive impact of treatment on milk yield and mortality. At the same time, significant improvements are seen in terms of reduced morbidity due to antibiotic injections that shortened morbidity periods caused by livestock diseases.

Informants in the present study also expressed that in agro-pastoralist areas. Farming has increased due to the increment of draught power of the animals by anthelmintics and antibiotic treatment of CAHWs. At the same time, CAHWs have given multidimensional advice to the communities to adapt and expand farming programme, which is complementary to the livestock keeping. Income from daily labourer base employment service in NGOs and government projects also contributed to increase the general livelihood of the communities. Most of the cases, the communities have deep support to the CAHWs service programmes by believing that CAHWs have contributed more to maximize and improve their livelihoods. Even the communities living in non CAH intervention sites expressed their views that CAHWs are the pivotal solution to upgrade their livelihoods. For this reason, they have been frequently requesting the concerned parties to get immediate CAHWs programme in their areas. Similar findings were reported by Mogga (2001) who stated that changed in livestock benefits could have well been caused by the primary animal health programme, and thus, reflect the impact of PAHC.

In the present study, livestock rearing, veterinary service providing, trading, and others like support from parents are means of livelihoods of CAHWs. Earlier study showed that CAHWs earned about 25% to 39% of their total cash income from their veterinary service charge in

Gewane and Amibara of Afar region (EPIAT, 2002). CAHWs livelihood has increased considerably after they engaged in community animal health service providing. They revealed that their livestock rearing and trading were increased by two folds after their involvement in community animal health service delivery programme. Most of the CAHWs in our study area are pastoralists, as the result, their livelihood in crop farming is unchanged. This is in line with EPIAT (2002) who reported that CAHWs are mostly dependent on livestock for their survival, like the other community members. This study shows that CAHWs have increased their income in that they have purchased emaciated and sick animals with cheap price from the communities, and after deworming, treating and well managing the animals, they sold the animals with attractive price to the vicinity towns and the communities. Most of the time, CAHWs have got the initial capital for their trading from veterinary service charge and drug sells. Therefore, their trading activity has relied on their veterinary service providing to the community. A similar result has also been reported by Mogga (2001) who indicated that CAHWs generated their income directly from the profit of selling drugs, which were given as a capital in the Northern Wollo PAHC programme.

In the present study, the total of four animal health delivery systems, namely; public service, illegal drug dealers (black market), CAHWs and traditional healers are available in the study area. CAHWs have been found near to the community and responded quickly when animals got sick. Other service providers are either far to access or poor in capacity. Furthermore, CAHWs are the main quality and quantity drug sources for the herders and served better than other service providers. As the result, the communities confirmed that animals recovered soon with CAHWs service delivery.

The present study also shows that the community in CAH intervention sites agreed that the service provided by CAHWs is cheaper than the services provided by other vet service providers. Moreover, CAHWs are giving advice (prevention, treatment, production, ecology) for the society and the community created better trust to CAHWs as compared to other service providers. This is in agreement with the previous reports *(*Mugunieri *et al.2004*; NPIACT, 2002) in that CAHWs are more accessible to livestock keepers than any other formal veterinary service providers.

The present study also agrees well with Rubyogo (2003) who stated that an assessment of farmers' views on CAHWs revealed that CAHWs are accessible, affordable and timely

service offering with good recovery rates as has been reported by (Mogga, 2001; IDL group, 2003).

From the present study, it is also clear that illegal drug dealers (black market) and herder treatment are the most significant veterinary service providers in non CAH intervention sites. Informants in non CAH intervention sites have significantly agreed that illegal drug dealers (black market) and herder treatment have good quality drug. Moreover, they have been known to give advice to the community, they have treated all cases with affordable price. The community trusted their service; the community supported their service than other service providers. Compatible with this study, other studies also showed that in the absence of CAHWs, livestock keepers would have to rely on their own knowledge, or on the advice provided by drug stores as has been reported by (Mugunieri *et al*., 2004). At present study, the community in CAH intervention sites almost have refused to use drug black market/illegal drugs and they have stopped to treat their animals by themselves. This has an implication to decrease the threat of drug resistance development in ther area.

This study shows that as the result of CAHWs activities and their extension works on the drawback of black market, no illegal drug dealers' (black-market) services are available in all CAH intervention sites. As a result, the communities are not treating their animals by themselves or use black market drugs provided that other alternative veterinary service providers are available. In agreement with our results, McCorkle (2003) described the impact of CAHWs on disease related losses is probably due to their effect on reducing the level of drug misused by livestock keepers. In addition, in the absence of CAHWs, livestock keepers are left without option, but forced treat their animals by themselves. (Rubyogo, 2003) has also concluded that CAHWs have performed with a sufficient level of technical competence that minimised the problem of drug resistance, particularly when compared with drugs used by farmers and quacks. The same author has also described that the CAHWs are using veterinary drugs correctly and have good quality drugs in their kits.

In Mozambique and Ghana, farmers have used antimicrobials routinely but, with limited knowledge on correct usage and often from black-market suppliers (Catley *et al.*, 2004). In the absence of CAHWs, most farmers have cited the local, untrained drug sellers as being their main source of advice. When CAHWs are present, however, over 70% of livestock keepers ranked them as their preferred source of animal health advice, and assessment of the community indicated that CAHWs advice was correct (Catley *et al.*, 2004). In line with this,

IDL group (2003) have stated that in villages with out CAHWs, the most frequent source of animal health services in Kenya were drug stores manned by untrained persons and in Philippines, most people with out access to CAHWs treated their animals themselves.
The current study confirms that CAHWs have high capacity to solve most animal health problems such as treating external and internal parasites; infectious diseases and wounds. They also advise the community and provided castration and vaccination service. Subsequently, mortality of various livestock species has decreased for the last three years in CAH intervention area as also reported by (Catley *et a l.,* 2004; Rubyogo, 2003). Catley (1999) has also showed with similar manner that CAHWs and cattle crush improved animal health because more animals are vaccinated and treated. For this reason, general livestock mortality has decreased from 100-30 after the implementation of CAHWs in Kathile area of Southern Sudan. McCorkle (2003) noticed that livestock mortality in selective CAH intervention villages of Kenyan, Tanzania and Philippines is very less compared with similar villages in non CAH intervention area. For example, in Kenya, average annual mortality of cattle and sheep/goat is 19% and 22%, respectively, in non CAH intervention area, whereas annual mortality of cattle and sheep/goat is 11% and 7%, respectively, in CAH intervention areas.

In contrast, this study shows that livestock mortality has increased for the last three years in non CAH intervention sites due to the interruption of erratic public veterinary services. Moreover, the frequent occurrence of drought aggravated the susceptibility of livestock to different diseases in non CAH intervention sites. In accordance with the current study, EPIAT (2002) reported that mortality of cattle, shoats (sheep and goats) and equine has decreased by 80%, 67%, and 42%, respectively, in Arsgie village II in Afar region after the intervention of CAH programme. This study is also in agreement with (Catley *et al.,* 2004) who elaborated that CAHWs in Afghanistan are found to reduce mortality by 5% in calves, 10% in lambs and 38% in kids compared with control areas without CAHWs. In the Philippines, 93% of farmers with access to CAHWs used worm control and 40% used vaccination, compared with 45% and 0.3% of farmers, respectively, without access to CAHWs. Mortality in small stock is approximately 50% lower in villages with CAHWs and in these areas, 71% of farmers preferred to use CAHWs relative to other service providers. Mogga (2001) reported that livestock owners are no longer afraid of diseases such as rinderpest, CBPP and manges that ranked high before the PAHC establishment and are now under control in most areas. McCorkle (2003) has showed that access to CAHWs could greatly reduce the number of livestock deaths associated with disease. Mortality rates for cattle, sheep, goats, and pigs on

farms with access to CAHWs are nearly half of those recorded on similar farms without access to CAHWs.

Informants in this study have significantly agreed on the fact that cattle diseases that are managed by CAHWs such as dhigis (black leg), boqta (pasteurellosis), cashi (helminthosis), dhawa (wound), haran (anthrax), sombob (CBPP), shillin (tick infestation), gofle (mastitis), sogudud (babesiosis) and ampbaar (mange) are significantly decreased in CAH intervention sites. They have also confirmed that shillin (tick infestation) that affected all species of domestic animals decreased with minimum rate amongst other diseases in CAH intervention sites and thus, treatment cost for all animals would be difficult for the herders at one time. Consequently, gofle (mastitis) has also decreased with fewer rates compared with other treatable diseases due to high prevalence of shillin (tick infestation). On the other hand, cattle diseases that were not managed by CAHWs such as burbur (LSD), dheberjebiye (botulism) and cabeb (FMD) have remained still static similar to the event that happened three years ago in CAH intervention sites.

This study also shows that cattle diseases such as dhigis (black leg), boqta (pasteurellosis), cashi (helminthosis), dhawa (wound), haran (anthrax), sombob (CBPP), shillin (tick infestation), gofle (mastitis), sogudud (babesiosis) and ampbaar (mange) that have decreased in CAH intervention areas have increased in their prevalent rate in non CAH intervention areas for the last three years. This is because of sporadic public veterinary service interruption and frequent drought occurrence in the area has made the cattle vulnerable to different diseases. Boqta (pasteurellosis), haran (anthrax) and cabeb (FMD) are the cattle diseases that have not shown any change for the last three years in non CAH intervention sites. Informants confirmed that dheberjebiye (botulism) is increased in non CAH intervention site because of the frequent drought had urged cattle to eat dead tortoise and bone of dead animals. But dheberjebiye (botulism) is remained unchanged in CAH intervention areas because CAHWs advised the communities to bury and burn (dispose) the dead tortoise as well as other carcasses. Burbur (LSD) in non CAH intervention area is slightly increased. Whereas, burbur (LSD) has existed in CAH intervention areas as it was before three years since CAHWs disinfected the wound to decrease its severity. On the other hand, cabeb (FMD) has remained to exist in both CAH and a non CAH intervention site as it was before three years.

The informants in the present study agreed that most sheep and goat diseases like sombob (CCPP), cashi (helminthosis), ampbaar (mange), boqta (pasteurellosis), shillin (tick

infestation), dhawa (wound) and haran (anthrax) that are treated by CAHWs have decreased in CAH intervention sites. Similarly, earlier studies showed that sheep and goat diseases have reduced by 50% since the beginning of CAH intervention in Amibara of Afar regional state (EPIAT 2002). Diseases of sheep and goat that have been handled by CAHWs have showed notable decline (NPIACT, 2002). While, in the present study, jenweren (respiratory disease complex) has increased and gedanod (sheep and goat pox) remained at the level it existed three years ago in CAH intervention sites. Whereas sheep and goat diseases such as sombob (CCPP), cashi (helminthosis), ampbaar (mange), boqta (pasteurellosis), gedanod (sheep and goat pox), shillin (tick infestation), dhawa (wound) and jenweren (respiratory disease complex) have increased for the last three years in non CAH intervention sites. Haran (anthrax) has not shown any change in non CAH intervention sites for the last three years. Jenweren (respiratory disease complex) has increased even in CAH intervention areas since its causative agent is unknown and some times, there is healing of animals after treated by CAHWs and some times no improvement. The reasons why many sheep and goat diseases have increased in non CAH intervention sites are the fact that public service has stopped its activities for the last three years. As the result, diseases that could be treated easily were flared up during the frequent drought. Informants in non CAH intervention sites have not agreed on their views concerning changes on sheep and goat diseases. The reason may be women who have the deep knowledge on sheep and goat diseases have not been participated in the study due to social barrier.

The entire informants in this study have significantly agreed that most camel diseases such as ampbaar (mange), haran (anthrax), cashi (helminthosis), mellig (trypanosomosis), shillin (tick infestation), dhugato (pneumonia), sinade (respiratory diseases complex) and dhawa (wound) have decreased considerably but shimbir (paralysis) and furq (camel pox), have remained unchanged in CAH intervention sites for the last three years. They revealed that camel diseases like furq (camel pox) and shimbir (paralysis) that have not been managed by CAHWs have prevailed in the area as they were before three years. On the other hand, informants expressed that ampbaar (mange), mellig (trypanosomosis), shillin (tick infestation), dhugato (pneumonia), dhawa (wound) and shimbir (paralysis) have increased whereas, haran (anthrax), cashi (helminthosis), sinade (respiratory disease complex) and furq (camel pox) have not been changed in camel in non CAH intervention sites for the last three years. It has been also revealed that there is substantial reduction in losses from camel diseases, which have been treated by CAHWs (EPIAT, 2002).

The informants of the present study have also agreed that donkey diseases like cashi (helminthosis), quffa (coughing), mellig (trypanosomosis), dhawa (wound), bejho (trypanosoma equiperdum) and sogudud (babesiosis) have decreased in CAH intervention areas due to the activities of CAHWs. Whereas, cashi (helminthosis), quffa (coughing), dhawa (wound), bejho (trypanosoma equiperdum) and sogudud (babesiosis) have remained to exist as they were before three years, and mellig (trypanosomosis) and dhawa (wound) have increased in non CAH project areas. Informants in CAH intervention sites have not agreed their views concerning changes of donkey diseases. The reason might be that all the informants of the study are males who have the superficial knowledge on donkey diseases, since donkeys are mostly managed by women to fiche water as well as to transport goods from /to market and home. Other workers have also reported that the community is lacking knowledge of donkey diseases because donkeys are the most neglected animals and the communities are not interested in donkey diseases during the discussion (Bekele, 2003; NPIACT, 2002).

The present study shows significant agreement between CAHWs animal diseases diagnosis ability and the modern laboratory test. Kappa agreement test results with 95% confidence interval are 0.0654, 0.643 and 0.637 for the diagnosis of trypanosomosis on cattle, trypanosomosis on camel and CBPP on cattle, respectively, which has revealed substantial agreement between CAHWs diagnosis and modern laboratory results. This finding is further supported by Thrusfield (1995) who described that Kappa range from 0.61-0.80 is showing substantial agreement between the two tests. Dasebu *et al*. (2003) also has reported that the average diagnostic skills of CAHWs across the range of common diseases is put as 85% percent of the diagnoses made are apparently accurate and appropriate, while only 12 percent are described as poor or incomplete.

In consistence with this study, earlier studies described that the knowledge of the CAHWs is sufficient to handle clinical cases of diseases (EPIAT 2002). There is a 90% CAHWs pass rate on technical competence test with AHAs and it is notable that CAHWs are able to describe diseases that have not been covered in their training (Rubyogo, 2003). At the same time, 90% of CAHWs have passed the test given regarding to notifiable diseases and are able to convey relevant information to the veterinary information to the veterinary authorities in their areas of operation. Additionally, 93% of CAHWs have passed the test concerning knowledge and actual use of veterinary drugs, including estimation of dosages and safe use of veterinary drugs and equipment. CAHWs also have performed with a sufficient level of

technical competence and they are using veterinary drugs correctly and have good quality drugs in their kits (Rubyogo, 2003). In Tanzania, assessment of the technical competence of 36 CAHWs by a team that has included the veterinarians has concluded that 34 (94%) are of sufficient standard and able to correctly calculate drug dosage (Catley *et al.*, 2004).

6. CONCLUSIONS AND RECOMMENDATIONS

The livelihoods of the pastoral and agro-pastoral communities and CAHWs as well as various types of benefits from livestock were found considerably increased in CAH intervention area. The general livelihoods of the community were decreased for the last three years in non CAH intervention sites.

It was found that CAHWs were almost the only veterinary service providers and the most preferable in their intervention sites. There were not herder treatments and black-market /illegal veterinary services in CAH intervention sites except very little traditional healers and public services. Black-market/illegal drug dealers and herder treatment were the most prevailing means to get veterinary services and they were preferred by the communities in non CAH intervention areas. Therefore, this study proves that CAHWs were the prime means to decrease the threats of drug resistance in their intervention areas by reducing the occurrence of black market/illegal drug dealers and herder treatments substantially.

Community-based animal health workers (CAHWs) played appreciable roles to show a dramatic impact on general livestock diseases reduction in their intervention areas. Communities did not reach on agreement concerning changes of small ruminants and donkey diseases. This might be possibly the fact that women who have the better knowledge and more familiar with small ruminant and donky diseases were not included in the study due to social barrier. Women CAHWs were not trained by CAH service delivery implementer NGOs and the government. Women CAHWs were found to be the entry point to contact with women pastoralist and agropastoralist communities.

CAHWs animal diseases diagnostic ability had significant agreement with modern laboratory results as evidenced from the two important selected diseases, namely; trypanosomosis and CBPP.

The communities at both CAH intervention areas and non CAH intervention areas well understood the benefits of CAHWs invariably due to the traditional speedy information transfer in the areas. As the result, communities in non CAH intervention sites were frequently requesting NGO and the government to get CAH service delivery soon.

It is, therefore, recommended that:

- The federal (central) and regional government veterinary service bureaus should take active role to institutionalise CAH service delivery system. Moreover, they should assign the required manpower and share resources as well as relevant logistic for the programme.

- The higher learning institutions (universities and colleges), veterinary laboratories and research organizations should take the problems of animal health in the pastoralist and agropastoralist areas as their priority agenda in their development, teaching and research endeavour. CAHWs are technically competent; therefore, the institutions should utilize them for their research and education activities. Furthermore, there should be development of willingness to respect the communities and learn from indigenous services and knowledge. For this reason, veterinarians and other related professionals should develop interest to disseminate the experience in participatory epidemiology through academic and information publications and workshops.

- The CAH service delivery system programme implementers should do proper selection, training, refresher training, monitoring and evaluations with sufficient logistics supply. Strengthening and formation of village committees right at the beginning of the project to supervise CAHWs activities and to keep the welfare of CAHWs should be carried out.

- Duties and responsibilities of CAHWs need to be set by national policy and legislation. At the same time, contents and duration of training as well as refresher training programme should be set evenly at national level.

- Establishment of dependable linkage between CAHWs and private veterinary drugs/equipment suppliers has been found the best alternative to keep the sustainability of CAH service delivery system in the area. For this reason, subsidized and free drugs/equipment distribution by the government and NGOs needs to be stopped to encourage private drug/equipment suppliers/dealers. Similarly, CAHWs associations are found to be the solution to empower the CAHWs to create sustainable linkage with NGOs, private veterinary drug/equipment suppliers, veterinarians, and government offices. Therefore, establishment and legalization of CAHWs associations should be performed at all CAH service delivery intervention areas.

- Incentives and capacity building in the form of workshops and supplementary trainings for CAHWs should be considered as important components to upgrade CAH service delivery programme.

- The stakeholders in the respective projects should train women CAHWs and the prospective researchers should have to find mechanisms to incorporate women of pastoralist communities for their studies in general and concerning the benefits and diseases of small ruminants and donkeys in particular.

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8. ANNEXES

8.1. CAHWs reporting formats developed by ECC-SADCOH

8.1.1. Format 1

CAHW NAME

MONTH







Total_____

CAHW's signature _____

Date _____

8.1.2. Format 2

CAHW NAME

MONTH







Total_____

CAHW's signature _____

Date _____

8.1.3. Format 3

CAHW NAME ________________

MONTH

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	O O O O O	O O O O O	O O O O O	O O O O O	O O O O O	

Total________________

CAHW's signature ________________

Date ________________

8.2. English equivalent names for common livestock diseases found in the study area

No.	Local name	English equivalent	Remark
1	Haran	Anthrax	Somali
2	Dhigis/Etias/Garabgoye	Black quarter	Somali
3	Cashi/Goriyan/Caal	Helminthosis	Somali
4	Cabeb	Foot and mouth disease	Somali
5	Burbur/Roore	Lumpy skin diseases	Somali
6	Shillin	Tick infestation	Somali
7	Sombob/Gubulo	CBPP and CCPP	Somali
8	Boqta/Silis	Pasteurellosis	Somali
9	Gofle	Mastitis	Somali
10	Ampbaar/Cadho	Mange	Somali
11	Dhawa/Naber	Wound	Somali
12	Dheberjebiye	Botulism	Somali
13	Sogudud	Babesiosis	Somali
14	Gedanod/Furq/Bunakuli	Pox	Somali
15	Jenweren/Dhugato/ Sinade	Pneumonia/respiratory diseases complex	Somali
16	Mellig/Turqin/Dhukan	Trypanosomosis	Somali
17	Shimbir/Gudhan/Dhulas	Paralysis	Somali
18	Quffa	Coughing	Somali
19	Bejho	Trypanosome equiperdum	Somali
20	Rafdilac	Foot rot	Somali

8.3. List of CAHWs trained by ECC-SDCOH (HCS)

No	Name of CAHW	Woreda	Settlement	Clan	Sub clan	Age
1	Abdulahi Dharar Gedi	Afdem	Seladamere	Issa	Sadmusa	40
2	Abdi Ahmed Awale	Afdem	Alijir	Issa	Eleye	28
3	Farah Jama Farah	Afdem	Afdeba	Issa	Sadmusa	30
4	Ferid Hamud Mohammed	Afdem	Biyokulul	Issa	Wardiq	38
5	Hassen Gured	Afdem	Alijir	Issa	Horone	33
6	Idele Abdulahi Wise	Afdem	Alijir	Issa	Walaldon	26
7	Jamma Abdi Aree	Afdem	Elbele	Issa	Horone	33
8	Muse Buh Wise	Afdem	Dhenkerone	Issa	Walaldon	29
9	Muse Dharar Halen	Afdem	Dereela	Issa	Actemor	39
10	Yesuf Ahmed Mawi	Afdem	Dheladu	Hawiya	Rermarden	17
11	Yesuf Anfare Samater	Afdem	Karaba	Hawiya	Wardiq	25
12	Aden Gamis Warsame	Meisso	Afase	Issa	Horone	20
13	Ahmed Gedi	Meisso	Afase	Issa	Sadmusa	31

14	Ahmed Jamma Umer	Meisso	Afase	Issa	Eleye	35
15	Ahme Nuh Ahmed	Meisso	Mulu	Hawiya	Amerti	26
16	Ahmed Ateye Gebad	Meisso	Afase	Issa	Walaldon	26
17	Mohammed Iduma	Erer	Assbuli	-	-	33
18	Ahmed Bahadon Ismail	Erer	Assbuli	-	-	35
19	Nur Bare Qawaiye	Erer	Assbuli	-	-	40
20	Farah Ahmed Umer	Erer	Assbuli	-	-	31
21	Ali Buh Dirane	Erer	Assbuli	-	-	23
22	Ali Umer Waise	Erer	Aydora	-	-	33
23	Hassen Ali Hassen	Erer	Aydora	-	-	35
24	Eden Hassen Wadom	Erer	Aydora	-	-	38
25	Aweled Suge Bahadon	Erer	Aydora	-	-	35
26	Abdi Guled Hassen	Shinile	Millo	-	-	32
27	Mohammed Nur Adem	Shinile	Adigala	-	-	32
28	Abib Mohammed Ismail	Shinile	Adigala	-	-	26
29	Roble Umer Buh	Shinile	Harari	-	-	25
30	Suleman Aden Gesale	Shinile	Harawa	-	-	23
31	Umer Ege Wabore	Shinile	Hariso	-	-	30
32	Musa Samare Ali	Shinile	Bider	-	-	25
33	Bayer Forid Ege	Shinile	Andobeb	-	-	26
34	Ali Are Idle	Shinile	Metto	-	-	26
35	Shaib Berket Shik	Denbel	Gedi	-	-	20
36	Ali Umer Hosh	Denbel	Gejeji	-	-	35
37	Said Ahmed Ibirahim	Denbel	Qaraley	-	-	20
38	Muse Soyah Farah	Denbel	Jebenta	-	-	45
39	Jamal Ali Hassen	Denbel	Agarwaynee	-	-	22
40	Mahad Mohammed Nur	Denbel	Jire	-	-	30
41	Abdi Mohammed Absiye	Denbel	Harmukle	-	-	30
42	Mohammed Hufane Qlib	Denbel	Samakab	-	-	27
43	Filfil Tahir Said	Denbel	Gilisa	-	-	25
44	Samire Ibirahim Waise	Denbel	Shebele	-	-	33
45	Niman Eden Bahadon	Denbel	Lowanage	-	-	20
46	Abdi Ibirahim Abdulahi	Denbel	Ashado	-	-	22
47	Mohammed Mumed Umer	Denbel	Biyobahe	-	-	19
48	Hussen Mumed Robele	Denbel	Dhuree	-	-	20
49	Mohammed Umer Gedid	Aysha	Gerbale	-	-	30
50	Mohammed Ismail Subane	Aysha	Durdur	-	-	35
51	Muse Ege Bulale	Aysha	Lasrat	-	-	40
52	Abdulahi Muse Bare	Aysha	Biyokabobe	-	-	25
53	Abdi Eden Ashkir	Aysha	Umerguluf	-	-	27
54	Abdulahi Hussen Hussen	Aysha	Biyogurgur	-	-	20

55	Salah Hamud Ahmed	Meisso	Kurfasawa	Hawiya	-	30
56	Umer Rage Said	Meisso	Mencha	Hawiya	-	24
57	Gemiyee Eltire Hassen	Meisso	Butujji	Issa	Harla	30
58	Aden Aye Negeye	Meisso	Medene	Issa	Horone	30
59	Reshed Are Farah	Meisso	Golijan	Hawiya	-	31
60	Muse Aden Roble	Meisso	Abramedobe	Hawiya	-	30
61	Hussen Burale Direne	Meisso	Gedmalu	Issa	Harla	20
62	Ali Waise Eleye	Meisso	Germalu isse	Issa	Harla	20
63	Tahir Abdi Ali	Meisso	Germalu	Issa	Walaldon	20
64	Kali Waberi Jamma	Meisso	Gedmalu	Issa	Walaldon	22
65	Ilmi Isman Ali	Afdem	Undufo	Issa	Furlabe	22
66	Umer Roble Bare	Afdem	Undufo	Issa	Furlabe	20
67	Hussen Idiris Direne	Afdem	Undufo	Issa	Harla	23
68	Abdule Umer Maid	Afdem	Undufo	Issa	Urwayne	19
69	Abdulahi Ege Jamma	Afdem	Adayito	Issa	Rermuse	20
70	Mohammed Farah Hassen	Afdem	Adayitu	Issa	Dhurwayne	21
71	Humad Isman Rage	Afdem	Adayitu	Issa	Furlabe	20
72	Ibirahim Ilmi Abdella	Afdem	Adayitu	Issa	Harla	19
73	Umer Hassen Reyale	Afdem	Adayitu	Issa	Furlabe	24
74	Hosh Ahmed Dirar	Afdem	Adayitu	Issa	Dhurwayne	21
75	Habad Usman Rege	Shinile	Hariso	-	-	-
76	Musa Umer Gedi	Shinile	Hariso	-	-	-
77	Bare Abdid Hirab	Shinile	Gad	-	-	-
78	Arab Osman	Shinile	Beraq	-	-	-
79	Mohammed Berkele	Shinile	Dike	-	-	-
80	Abdulahi Abdi	Shinile	Dinley	-	-	-
81	Awale Hosh	Shinile	Harkale	-	-	-
82	Mohammed Farah	Aysha	Biyodidile	-	-	-
83	Arab Ahmed Umer	Denbel	Harawato	-	-	-
84	Ali Umer Murud	Denbel	Gilisa	-	-	-
85	Mamed Ege Usman	Denbel	Lowanaji	-	-	-
86	Ali Abdulahi	Denbel	Dhure	-	-	-
87	Musa Delal	Afdem	Dhenkerone	-	-	-
88	Umer Muse Gele	Afdem	Bike	-	-	-
89	Zebene Hale	Anchar	Midedu	-	-	-

8.4. CAHWs revolving fund monitoring summary format developed by ECC-SDCOH

No.	Name of CAHWs	Woreda	Total value of drugs replenished	Total cash collected	Balance
Total					

Reported by----------

Signature----------

Date----------

8.5. Pastoralist associations (PAs) where the study was conducted

No.	Name of pastoralist association	Remark
1	Gedugaz	Pastoralist (Somali)
2	Keref	Pastoralist (Somali)
3	Horefule	Agropastoralist (Somali)
4	Adigura	Pastoralist (Somali)
5	Misomafugnan	Agropastoralist (Oromia)
6	Kentery	Pastoralist (Somali)
7	Dhimbis	Pastoralist (Somali)
8	Kelale	Pastoralist (Somali)
9	Dhiksile	Pastoralist (Somali)
10	Siselu	Pastoralist (Somali)
11	Tuleyitu	Agropastoralist (Somali)
12	Mulu	Agropastoralist (Somali)
13	Armale	Agropastoralist (Somali)
14	Mencha	Agropastoralist (Somali)
15	Kurfasawa	Agropastoralist (Somali)
16	Kulemiye	Agropastoralist (Somali)
17	Kerely	Pastoralist (Somali)
18	Selademere	Pastoralist (Somali)
19	Alijir	Pastoralist (Somali)
20	Derela	Pastoralist (Somali)
21	Shekonedie	Pastoralist (Somali)
22	Leleba	Pastoralist (Somali)
23	Abdulerobe	Pastoralist (Somali)
24	Marmar	Pastoralist (Somali)
25	Hawale	Pastoralist (Somali)

26	Korole	Pastoralist (Somali)
27	Shekbarie	Pastoralist (Somali)
28	Deges	Pastoralist (Somali)
29	Bedene	Pastoralist (Somali)
30	Shilile	Agropastoralist (Somali)
31	Arale	Agropastoralist (Somali)
32	Gububi	Pastoralist (Somali)
33	Turara	Pastoralist (Somali)
34	Afdem	Pastoralist (Somali)
35	Megalakelo	Pastoralist (Somali)

8.6. Pictures of individual and group discussions (interviews) taken during the study

8.6.1. Group discussion

8.6.2. Individual interview




8.7. Tables of participatory results

8.7.1. Livestock composition

Sites	Cattle	Sheep	Goat	Camel	Donkey
Tuleyitu	46	3	5	35	11
Mulu	44	4	14	31	7
Armale	55	4	10	27	4
Mencha	28	18	22	25	7
Kurfasawa	30	6	12	40	12
Kulemiye	42	4	10	30	14
Kerely	48	9	13	26	4
Selademere	21	17	44	12	6
Alijir	27	24	15	25	9
Derela	30	15	35	15	5
Gedugaz	20	25	31	18	6
Keref	33	21	23	18	5
Horefule	31	16	20	24	9
Adigura	10	24	44	19	3
Misomafugnan	27	11	25	28	9

Kentery	38	14	24	8	16
Dhimbis	23	22	28	20	7
Kelale	35	20	22	16	7
Dhiksile	36	14	27	20	3
Siselu	18	32	36	11	3

8.7.2. Livestock keeping constraints

Sites	Drought/feed	Diseases	Predators	Others
Tuleyitu	37	38	15	10
Mulu	54	28	18	0
Armale	49	35	13	3
Mencha	38	48	14	0
Kurfasawa	54	34	12	0
Kulemiye	52	38	6	4
Kerely	25	49	26	0
Selademere	10	76	13	1
Alijir	9	56	35	0
Derela	34	33	30	3
Gedugaz	37	42	21	0
Keref	30	36	15	19
Horefule	40	46	14	0
Adigura	15	63	19	3
Misomafugnan	13	20	16	51
Kentery	32	13	17	38
Dhimbis	42	47	11	0
Kelale	35	38	13	14
Dhiksile	40	25	17	18
Siselu	43	44	13	0

8.7.3. Means of livelihoods of the community

Sites	Livestock rearing	Crop farming	Trading	Others
Tuleyitu	56	17	15	12
Mulu	51	34	9	6
Armale	48	32	7	13
Mencha	70	22	4	4
Kurfasawa	48	28	12	12
Kulemiye	61	31	8	0
Kerely	80	0	12	8
Selademere	89	0	8	3
Alijir	97	1	1	1
Derela	90	10	0	0

Gedugaz	100	0	0	0
Keref	83	0	17	0
Horefule	64	28	3	5
Adigura	98	0	2	0
Misomafugnan	33	61	6	0
Kentery	32	52	16	0
Dhimbis	100	0	0	0
Kelale	85	0	15	0
Dhiksile	66	34	0	0
Siselu	100	0	0	0

8.7.4. Changes on means of the livelihoods of the community in CAH intervention sites (from 10)

Sites	Livestock rearing	Crop farming	Trading	Others
Tuleyitu	15	13	14	12
Mulu	25	22	19	10
Armale	21	24	25	10
Mencha	20	17	18	10
Kurfasawa	21	10	16	10
Kulemiye	19	18	15	10
Kerely	22	10	14	7
Selademere	30	10	10	10
Alijir	27	10	10	10
Derela	23	21	10	10

8.7.5. Changes on means of livelihoods of the community in non CAH intervention sites

Sites	Livestock rearing	Crop farming	Trading	Others
Gedugaz	7	10	10	10
Keref	6	8	5	10
Horefule	8	5	6	10
Adigura	8	10	5	10
Misomafugnan	6	6	8	10
Kentery	7	5	5	10
Dhimbis	8	10	10	10
Kelale	7	10	4	10
Dhiksile	5	4	10	10
Siselu	5	10	10	10

8.7.6. CAHWs means of livelihoods

Name of CAHW	Livestock rearing	Crop farming	Service providing	Trading	Others
Ferid Hamud	46	0	40	14	0
Mussie Derara	60	6	34	0	0
Yesuf Ahmed	56	16	28	0	0
Ahmed Jamma Ummer	58	0	28	14	0
Yesus Alfari	40	0	42	10	8
Ahmed Nur Ahmed	16	14	64	6	0
Sala Ahmud Ahmed	56	22	22	0	0
Aden Aye Negeye	70	0	22	8	0
Ahmed Gedi Rerash	56	0	25	19	0
Robli Ateye	67	0	20	13	0

8.7.7. Changes on livelihoods of CAHWs

Name of CAHW	Livestock rearing	Crop farming	Trading
Ferid Hamud	24	10	20
Mussie Derara	19	10	10
Yesuf Ahmed	20	10	10
Ahmed Jamma Ummer	20	10	18
Yesus Alfari	20	10	22
Ahmed Nur Ahmed	24	15	20
Sala Ahmud Ahmed	21	15	10
Aden Aye Negeye	19	10	20
Ahmed Gedi Rerash	18	10	25
Robli Ateye	17	10	24

8.7.8. Purposes of keeping livestock

8.7.8.1. Cattle

Sites	Income source	Milk	Meat	Breeding	Prestige	Ploughing	Others
Shekonedie	16	23	8	10	31	4	8
Leleba	15	24	8	7	32	4	9
Abdulerobe	12	27	7	9	30	8	9
Marmar	12	24	8	8	30	10	8
Hawale	11	24	8	9	28	11	9
Korore	13	22	9	8	34	8	7
Shekbarie	12	25	8	10	27	8	10
Deges	12	24	7	10	28	10	9
Bedene	14	24	7	9	34	4	8

Megalakelo	13	23	8	22	32	0	2
Shilile	12	17	10	8	38	11	4
Arale	12	16	7	7	43	8	7
Kurfasawa	11	18	10	8	39	9	5
Gububi	16	20	10	8	36	0	10
Turara	12	31	7	8	33	3	6
Mulu	12	20	10	10	35	10	3
Mencha	15	23	8	9	32	4	9
Armale	13	20	9	8	33	9	8
Derela	16	23	8	10	32	4	7

8.7.8.2. Sheep

Sites	Income source	Milk	Meat	Breeding	Prestige	Ploughing	Others
Shekonedie	16	24	10	10	31	0	9
Leleba	16	25	10	9	32	0	8
Abdulerobe	14	23	13	10	28	0	12
Marmar	16	21	12	10	30	0	11
Hawale	16	23	13	9	29	0	10
Korore	16	20	12	8	33	0	11
Shekbarie	16	23	12	11	26	0	12
Deges	16	25	11	10	28	0	11
Bedene	17	20	8	10	34	0	9
Megalakelo	16	26	10	6	30	0	12
Shilile	19	21	13	9	35	0	3
Arale	17	19	10	6	45	0	3
Kurfasawa	28	24	10	8	26	0	4
Gububi	16	20	10	8	36	0	10
Turara	13	22	8	13	38	0	6
Mulu	20	20	10	10	36	0	3
Mencha	16	19	8	12	34	0	10
Armale	14	20	12	9	33	0	12
Derela	14	20	8	10	38	0	10
Afdem	17	21	12	6	36	0	8

8.7.8.3. Goats

Sites	Income source	Milk	Meat	Breeding	Prestige	Ploughing	Others
Shekonedie	16	24	9	10	32	0	9
Leleba	16	25	10	9	32	0	9
Abdulerobe	14	23	13	10	28	0	12
Marmar	16	21	12	10	30	0	12
Hawale	16	22	13	9	29	0	10

Korore	16	20	12	8	32	0	11
Shekbarie	16	24	12	11	26	0	12
Deges	16	23	11	10	29	0	11
Bedene	13	25	8	10	35	0	9
Megalakelo	15	25	11	8	29	0	12
Shilile	19	20	13	9	35	0	4
Arale	17	20	10	6	44	0	3
Kurfasawa	28	25	9	8	26	0	4
Gububi	16	21	9	8	36	0	10
Turara	13	21	8	11	41	0	6
Mulu	28	25	9	8	26	0	4
Mencha	16	20	8	11	35	0	9
Armale	16	22	12	9	29	0	12
Derela	14	21	8	10	37	0	10
Afdem	14	23	10	4	34	0	15

8.7.8.4. Camels

Sites	Income source	Milk	Meat	Transport	Prestige	Ploughing	Others
Shekonedie	12	29	5	16	36	0	2
Leleba	12	29	6	16	35	0	2
Abdulerobe	10	30	7	13	36	0	4
Marmar	11	27	9	12	36	0	5
Hawale	12	27	8	12	37	0	5
Korore	12	26	8	14	36	0	4
Shekbarie	13	27	7	14	35	0	4
Deges	9	28	7	16	37	0	3
Bedene	14	24	7	25	28	0	2
Megalakelo	14	23	8	21	32	0	2
Shilile	10	28	9	17	35	0	1
Arale	5	33	7	21	31	0	3
Kurfasawa	19	23	7	21	29	0	1
Gububi	10	26	8	20	35	0	1
Turara	10	28	8	20	33	0	1
Mulu	12	22	10	14	40	0	2
Mencha	11	30	6	21	31	0	1
Armale	14	28	8	10	37	0	3
Derela	12	27	7	15	36	0	3
Afdem	9	28	6	23	31	0	3

8.7.8.5. Donkeys

Sites	Income source	Milk	Meat	Transport	Prestige	Ploughing	Others
Shekonedie	20	0	0	53	27	0	0
Leleba	16	0	0	62	15	0	0
Abdulerobe	15	0	0	75	10	0	0
Marmar	26	0	0	60	14	0	0
Hawale	17	0	0	70	13	0	0
Korole	21	0	0	60	19	0	0
Shekbarie	20	0	0	65	15	0	0
Deges	18	0	0	68	14	0	0
Bedene	13	0	0	67	20	0	0
Megalakelo	11	0	0	67	22	0	0
Shilile	30	0	0	50	20	0	0
Arale	15	0	0	42	44	0	0
Kurfasawa	32	0	0	50	18	0	0
Gububi	25	0	0	44	31	0	0
Turara	11	0	0	65	22	0	0
Mulu	22	0	0	58	20	0	0
Mencha	15	0	0	49	34	0	0
Armale	20	0	0	48	30	0	0
Derela	25	0	0	55	20	0	0
Afdem	12	0	0	80	8	0	0

8.7.9. Changes on benefits of livestock (from 10)

8.7.9.1. CAH intervention sites

Sites	Cash income	Milk	Meat	Restore wealth	Transportation	Power	Prestige	Others
Shilile	20	18	19	19	20	18	21	19
Arale	21	21	21	20	23	19	23	21
Kurfasawa	22	18	23	22	20	20	23	15
Gububi	20	21	22	20	21	22	22	21
Turara	18	19	20	19	19	21	19	19
Mulu	18	20	18	16	20	19	24	20
Mencha	19	20	21	20	22	17	21	19
Armale	19	18	20	20	18	18	23	20
Derela	19	18	20	17	16	16	24	18
Afdem	22	14	20	20	25	18	25	15

8.7.9.2. Non CAH intervention sites

Sites	Cash in come	Milk	Meat	Restore wealth	Transportation	Power	Prestige	Others
Shekonedie	7	4	6	7	6	5	5	4
Leleba	6	5	6	7	6	5	5	6
Abdulerobe	4	3	4	4	6	3	6	5
Marmar	5	3	3	4	5	4	5	4
Hawale	5	3	4	5	5	3	5	5
Korore	8	4	4	6	5	4	6	7
Shekbarie	5	3	3	4	6	3	6	5
Deges	6	4	4	4	7	5	4	5
Bedene	7	6	5	8	5	4	6	6
Megalakelo	8	4	4	7	5	5	6	8

8.7.10. Changes in livestock mortality (from 10)

8.7.10.1. CAH intervention sites

Sites	Cattle	Sheep	Goat	Camel	Donkey
Shilile	3	4	4	5	4
Arale	3	4	4	2	2
Kurfasawa	3	3	3	1	1
Gububi	3	3	4	2	2
Turara	5	2	3	2	1
Mulu	5	4	4	5	5
Mencha	4	2	2	3	1
Armale	3	4	5	3	2
Derela	5	5	5	3	3
Afdem	6	5	4	3	2

8.7.10.2. Non CAH intervention sites

Sites	Cattle	Sheep	Goat	Camel	Donkey
Shekonedie	14	15	14	12	11
Leleba	14	14	13	12	11
Abdulerobe	10	10	10	11	10
Marmar	13	15	14	10	10
Hawale	13	14	15	10	9
Korore	18	10	12	10	10
Shekbarie	11	13	13	11	10
Deges	15	18	16	12	10
Bedene	17	10	12	10	10
Megalakelo	18	12	13	12	10

8.7.11. Change in livestock diseases (from 10)

8.7.11.1. Cattle

8.7.11.1.1. CAH intervention sites

Sites	Haran	Dhigis	Cashi	Shillin	Sombob	Boqta	Gofle	Ampbaar	Dhawa	Dheberjebiye	Sogudud
Tuleyitu	3	3	5	10	4	4	10	5	4	15	2
Mulu	4	3	3	5	4	3	3	2	2	14	14
Armale	4	3	6	10	5	3	4	4	4	23	5
Mencha	3	4	4	6	3	3	2	3	3	10	7
Kurfasawa	3	2	3	5	2	3	6	3	2	10	6
Kulemiye	2	1	1	6	1	2	2	1	2	10	1
Kerely	4	5	5	8	2	6	2	4	6	11	2
Selademere	5	5	6	10	10	7	7	4	2	10	1
Alijir	3	2	8	10	13	4	2	10	3	10	7
Derela	4	4	8	6	9	5	4	6	4	10	6

8.7.11.1.2. Non CAH intervention sites

Sites	Haran	Dhigis	Cashi	Shillin	Sombob	Boqta	Gofle	Ampbaar	Dhawa	Dheberjebiye	Sogudud
Gedugaz	10	10	14	19	17	8	18	20	18	14	18
Keref	12	14	16	16	20	15	16	16	17	15	17
Horefule	9	12	16	25	24	10	22	10	12	27	10
Adigura	21	14	10	14	23	10	12	10	11	18	10
Misomafu.	5	10	16	14	10	12	18	18	10	10	10
Kentery	8	10	10	14	10	10	16	10	10	10	10
Dhimbis	8	11	16	24	25	10	20	16	20	15	16
Kelale	10	12	14	18	19	14	18	18	19	15	18
Dhiksile	7	7	14	19	19	10	14	10	15	15	10
Siselu	10	10	16	18	30	10	26	21	10	10	20

8.7.11.2. Sheep and goat

8.7.11.2.1. CAH intervention sites

Sites	Sombob	Cashi	Ampbaar	Boqta	Gedanod	Shillin	Dhawa	Jenweren
Tuleyitu	3	3	2	3	10	10	3	12
Mulu	4	6	2	3	2	3	2	11
Armale	5	5	2	2	5	7	4	15
Mencha	2	3	3	3	10	6	4	16
Kurfasawa	1	3	4	2	10	5	3	15
Kulemiye	3	2	1	2	10	2	2	11
Kerely	1	4	3	7	10	6	4	14
Selademere	10	4	5	5	10	6	1	18
Alijir	12	4	3	6	10	4	4	16
Derela	4	5	4	5	10	4	4	14

8.7.11.2.2. Non CAH intervention sites

Sites	Sombob	Cashi	Ampbaar	Boqta	Gedanod	Shillin	Dhawa	Jenweren	Haran
Gedugaz	22	14	17	10	15	10	18	19	10
Keref	23	17	14	15	16	23	16	19	15
Horefule	28	14	10	10	28	18	10	22	10
Adigura	19	10	16	17	10	15	10	16	10
Misomafu.	10	14	14	13	10	13	10	10	10
Kentery	10	15	8	10	10	12	10	10	10
Dhimbis	20	15	18	11	17	11	16	17	9
Kelale	21	19	16	16	18	24	15	18	13
Dhiksile	10	14	15	16	10	17	16	13	10
Siselu	11	10	10	10	10	10	10	10	10

8.7.11.3. Camel

8.7.11.3.1. CAH intervention sites

Sites	Ampbaar	Haran	Cashi	Mellig	Shillin	Furq	Dhugato	Sinade	Dhawa	Shimbir
Tuleyitu	3	2	3	8	10	9	3	4	3	10
Mulu	3	1	4	4	5	8	3	2	3	10
Armale	3	2	5	6	8	6	4	4	3	3
Mencha	5	2	4	6	6	10	4	4	3	10
Kurfasawa	5	1	3	5	5	10	3	3	2	10
Kulemiye	2	1	2	3	2	10	1	1	1	10
Kerely	5	1	2	6	10	10	6	4	10	12
Selademere	3	1	3	2	4	10	6	5	3	20
Alijir	1	0	3	6	5	10	4	3	6	10

Derela	3	1	4	5	6	10	3	1	3	12

8.7.11.3.2. Non CAH intervention sites

Sites	Ampbaar	Haran	Cashi	Mellig	Shillin	Furq	Dhugato	Sinade	Dhawa	Shimbir
Gedugaz	14	10	14	16	18	10	21	20	30	30
Keref	10	10	18	20	15	14	20	10	15	14
Horefule	17	10	10	20	20	25	10	20	12	30
Adigura	18	10	10	13	10	10	12	10	10	17
Misomafu.	14	10	10	10	13	10	10	8	10	10
Kentery	10	10	10	14	14	10	10	12	10	10
Dhimbis	16	9	15	18	16	11	18	17	21	26
Kelale	12	10	16	18	18	12	18	10	18	13
Dhiksile	16	10	10	14	16	15	15	17	21	10
Siselu	19	10	10	12	21	10	12	10	24	10

8.7.11.4. Donkey

8.7.11.4.1. CAH intervention sites

Sites	Cashi	Quffa	Mellig	Dhawa	Bejho	Sogudud
Tuleyitu	5	5	10	3	4	4
Mulu	3	4	4	2	3	3
Armale	3	2	4	2	2	3
Mencha	4	4	6	3	4	4
Kurfasawa	3	3	5	2	3	3
Kulemiye	1	1	7	1	2	2
Kerely	1	5	2	5	12	2
Selademere	4	3	3	3	14	1
Alijir	2	6	1	8	10	1
Derela	1	3	1	3	13	1

8.7.11.4.2. Non CAH intervention sites

Sites	Cashi	Quffa	Mellig	Dhawa	Bejho	Sogudud
Gedugaz	10	12	15	18	1	8
Keref	13	10	15	17	16	16
Horefule	10	10	16	12	24	10
Adigura	10	10	10	14	10	10
Misomafugnan	10	10	10	10	10	10
Kentery	10	10	10	10	10	10
Dhimbis	12	11	13	19	9	9
Kelale	15	11	14	20	1	15

Dhiksile	10	10	10	16	10	10
Siselu	10	10	10	15	10	10

9. CURRICULUM VITAE

Name:	Amare Dejenu Tadele
Nationality:	Ethiopian
Date of Birth:	11/09/1971
Place of Birth:	
Kebele	Gundomeskel
Woreda	Derra
Zone	North Shoa
Religion:	Christian
Language:	Amharic: Speaking and writing
	English: Speaking and writing

Educational Background:

1979-1982:	Primary education at Tuti elementary school (School certificate award), Derra
1983-1986:	Primary education at Gundomeskel elementary school (National certificate award), Derra
1987-1991:	Secondary education at Arebegnoch (patriotic) higher secondary school at Alem Ketema(National school leaving certificate award), Merehabete
1992-1993:	Addis Ababa University, Faculty of Science (pre-veterinary transcript), Addis Ababa, Ethiopia
1993-1998:	Doctor of Veterinary Medicine (DVM), in Addis Ababa University, Faculty of Veterinary Medicine, Debre Zeit, Ethiopia
2002-to date:	Master of Science (MSc) in Tropical Veterinary Epidemiology, in Addis Ababa University, Faculty of Veterinary Medicine, Debre Zeit, Ethiopia

Employment Background:

July, 1998-December, 1998:	**:<u>Technical Manager</u>**, in **Menber Trading**

Veterinary drug and Equipment importer, Addis Ababa, Ethiopia

January, 1999-February, 2002: **:<u>Head of Livestock Production and Veterinary Service Section</u>**: to conduct and lead mobile veterinary service at the remotest areas of the projects, vaccination campaign, veterinary drug and equipment supply to government veterinary clinics, exotic heifer distribution and management, bee keeping (apiculture) development, forage extension/development and artificial insemination programme in, **Menshen für Menschen Foundation, Derra (North Shoa) and Babile (Eastern Hararghe) Integrated Rural Development Projects, Ethiopia**.

:<u>Training Coordinator (Officer)</u> of Integrated Rural Development Projects: to coordinate all the training activities undergoing by all departments of the projects, namely; Agro-ecology department, health department, women and development department and water and construction department, in **Menshen für Menschen Foundation, Derra (North Shoa) and Babile (Eastern Hararghe) Integrated Rural Development Projects, Ethiopia**

April 2002-September, 2002: **:<u>Instructor/lecturer</u>**, in **Alagae Technical Agricultural College, Eastern Shoa, Ethiopia**

Professional Association: Ethiopia Veterinary Association

Other Skills and Experiences:

Third grade driving licence
Computer literate: Word, excel, access and power point
Participatory training management/PRA for the rural community
Planning and assessment of community projects

Research Activities: **:**Bovine Tuberculosis: Evaluation of diagnostic tests, prevalence and zoonotic importance (Ethiopia) for partial fulfilment of the requirements for the attainment of Doctor of Veterinary Medicine.

:A case control study on the impact assessment of community based animal health delivery system in Shinile zone, Somali National Regional State of Ethiopia for partial fulfilment of the requirements for the degree of Master of Science in Tropical Veterinary Epidemiology

Certificates Awarded: **:**Certificates from Derra (North Shoa) and Wegidi(South Woll) woredas for outstanding integrated rural development achievement and active community mobilisation.

:Certificate from BCS computer centre for completing words, excel, access and power point

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10. SIGNED DECLARATION SHEET

I, the under signed, declare that the thesis is my original work and has not been presented for a degree in any University.

Name: Amare Dejenu Tadele

Signature _____

Date of submission _____

This thesis has been submitted for examination with our approval as University advisors.

Dr. Merga Bekana _____

Dr. Berhanu Admassu _____