

## Factors Influencing Livelihood Zonation in Kenya

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### Abstract

Kenya is divided in various livelihood zones that are areas within which people share broadly the same patterns of livelihood. This livelihood is the same production system - agriculture or pastoralists as well as the same patterns of trade and exchange. Patterns of livelihood clearly vary from one area to another. Factors that influence zonation in Kenya are climate, soil, access to markets, geographical location and altitudes. In Kenya, two systems are used in classifying ecological zones namely the Food and Agricultural Organization (FAO) classification for tropics and an older Kenya version that is only applicable to Kenya. Food security and zonation are related and the different zones can be improved for Kenya to have food sovereignty. The ASALs zone which occupies 80% of land mass can contribute to Kenya being food secure by adaptation to climate change and by agricultural and livestock diversification.

**Keywords:** Diversification, Livelihood, Ecological, Zonation, Adaptation, Tropics

### 1. Introduction

Livelihood zones are areas within which people share broadly the same pattern of livelihood that is broadly the same production system - agriculture or pastoralist as well as the same patterns of trade and exchange (Lawrence, King & Holt 2011). Livelihood zoning includes drawing of maps, basic description of the patterns of livelihood in each zone, and ideally by an analysis of the underlying reasons for differences between zones. It also involves analysing in detail the production and trade/exchange options in each of the zones and the influence that the underlying geography has on each of these (Lawrence, King & Holt 2011). Zonation also refers to an arrangement or formation in zones of different livelihoods (online dictionary 2011).

Livelihood is the sum of ways in which households obtain necessities for life, both in good years and in bad. Those necessities include food, water, shelter, clothing and health care, with education often included too. The household is taken as the unit of reference because it is by far the chief unit, through which population anywhere operates for production, sharing of income and consumption.

Patterns of livelihood clearly vary from one area to another. Local factors such as climate, soil, access to markets and exchange all influence livelihood patterns. For example people living in fertile highland areas, generally pursue an agricultural pattern of livelihood, whereas in the lowlands they grow few crops and are either pastoralists or agro-pastoralists. Those living in a coastal or lakeside zones may follow a livelihood based upon fishing or combining fishing with other activities, and so on.

Aspects that determine patterns of livelihood include Agro-ecology and market access. Market access affects the ability of people to sell their production (crops or livestock or other items) and the price they obtain for these goods. Since patterns of livelihood depend so much upon geography, it makes sense to divide a country or a region into a number of livelihood zones. Kenya is classified broadly into ecological zones (Kenya soil survey, 2010). Agro-ecological Zoning (AEZ) refers to the division of an area of land into smaller units, which have similar characteristics related to land suitability, potential production and environmental impact. This paper will examine these agro ecological zones and explain the factors that influence livelihood zonation in Kenya.

## **2. ZONATION**

Ecological zones have a mix of altitude, rainfall and soil. Zoning in Kenya is divided agro-ecologically and this refers to the division of an area land into smaller units, which have similar characteristics related to land suitability, potential production and environmental impact. An agro-ecological zone is a land resource mapping unit defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use (FAO, 1996).

In Kenya, two systems are used in classifying ecological zones. These are the Food Agricultural Organization (FAO) classification for tropics generally, and an older Kenya version which is only applicable in Kenya (Kenya soil survey, 2010).

### **2.1 The Kenyan System**

Kenya has a total area of about 582,646 square kilometers of which 11,230 or about 1.9% is covered by water and 80% of the country lies in the semi-arid to very arid Zones (ASALs). The ASALs are predominantly inhabited by the pastoralists and agro-pastoralists (Sombroek, Braun, and van der Pouw 1982).

An older Kenya version for describing agro-ecological zones which is only applicable in Kenya divides it into six agro-ecological zones that are listed in the table below (Kenya soil survey, 2010).

As shown in table 1 virtually 80% of the country lies in the semi-arid to very arid Zones (ASALs), which are predominantly inhabited by the pastoralists and agro-pastoralists.

#### **2.1.1 Zone I**

This zone is the source of rain and some rivers/streams. It is confined to mountains and immediate surrounding such as Mt. Kenya and Mt Elgon.

#### **2.1.2 Zone II**

This zone is restricted to the highlands of Kenya between 1980 and 2700 m and occurs as a forest or open grasslands. This zone is found in the surrounding of Mt Kenya (parts of Meru, Embu, Kirinyaga and Nyeri), isolated parts of the Rift Valley around Mau and Abadares mountains (e.g around Kericho and Nyahururu respectively) and the surrounding of Mt Elgon (e.g around Kitale

and Webuye). The reliable rainfall is between 150 – 1700 mm. The main grasses are Kikuyu grass and Redoats. The legumes include Alfalfa or Lucerne (Kenya soil survey, 2010). The area is characterized by mixed farming of food and cash crops (tea, coffee and sugar cane). It has sophisticated trade, infra structure and long distances to markets. It has a high population and drought episodes are anomaly rare (Mango et. al 2009).

### **2.1.3 Zone III**

This zone occurs mainly at elevations between 900-1800 m with an annual rainfall between 950 and 1500 mm. Trees are numerous here and somewhat of shorter stature than in Zone II. This zone is the most significant for agricultural cultivation and several legume fodders are found here in crop-livestock systems. It is also the most resettled by humans. It occurs in the vast parts of Nyanza, Western and Central provinces, good proportion of Central Rift-Valley (Nandi, Nakuru, Bomet, Eldoret, Kitale) and a small strip at the Coast province fall within this zone. The major grasses are Congo signal, Rhodes grass and Star grass (Kenya soil survey, 2010).

### **2.1.4 Zone IV**

This zone occupies more or less the same elevation (900-1800 m) as the previous or may be at times lower. However, it has lower annual rainfall of about 500-900 mm. This is typically represented in surroundings of Naivasha, vast parts of Laikipia and Machakos districts vast parts of central and southern Coast Province. It is the home of most Acacia trees and shrubs. Euphorbia trees occur in some drier parts of this zone. Besides acacia, other important legumes include *Indigofera* and *Crotalaria* (Kenya soil survey, 2010). These areas are characterized by mixed farming of food crops, cash crops (palm, coffee and pyrethrum) and livestock farming (Mango et. al 2009). Aloe vera does well in this zone and so Aloe based business in Laikipia and its environs if well developed ( Wren, 2008b) can boost the country's' economy.

### **2.1.5 Zone V**

This zone is much drier than Zone IV and occurs at lower elevations. Annual rainfall is 300-600mm. This Zone is prevalent in northern Baringo, Turkana, lower Makueni and vast parts of North Eastern Province. Low trees and shrubs found here include different species of Acacia. It is home to livestock rearing and bee keeping (Kenya Soil Survey, 2010). The area is characterized by pastoralism with pockets of agro pastoralists and mixed farming including Tana River (Mango et. al 2009).

### **2.1.6 Zone VI**

This zone is considered as semi desert and is the driest part of Kenya. Annual rainfall is 200-400 mm and is quite unreliable. The zone is found in Marsabit, Turkana, Mandera and Wajir Districts. Dominant in this zone are *Acacia* and *Commiphora* shrubs with scattered taller trees of *Delonix elata*, *Acacia tortilis* and *Adansonia digitata*. This zone has acacia, shrubs and low tree species and annual or perennial occurrence of grass. Being the most delicate zone both annual and perennial grasses are important here. The inhabitants keep camels, donkeys, shoats and indigenous livestock (Kenya Soil, Survey, 2010).

### 2.1.7 Zone VII

This is represented by Chalbi desert in Marsabit district. The Chalbi is a salt desert with very sparse salt bushes as the only vegetation found. It is vast and of beautiful scenery. Pastoralists use it as a source of mineral lick for livestock, particularly during the rainy season (Kenya soil Survey 2011).

These zones can also be divided in terms of rainfall. Thus climatically, they can be divided into high rainfall zones, the medium and low rainfall areas (SRA, 2004).

The high rainfall zone has at least an annual rainfall ranging between 1200 – 1500mm and occupies less than 20% of the productive arable land (USAID, 2010). About 64 % of the country's population that is 24 million people live in this zone and most of the cash crops are produced under intensive or semi-intensive systems of production. This region, accounts for most production of tea, pyrethrum, Irish potatoes, coffee and vegetable production. It also accounts for 75% of milk production in Kenya (USAID, 2010). This region is referred to as, "Kenya's grain basket zone" (KFSSG, 2008).

The medium rainfall zone is where the rainfall received is 750 – 1000mm per year. It occupies 30 – 35 % of the country's land area (USAID, 2010). Farmers keep cattle, small shoats and drought resistant crops for example cassava, sorghum, millet, maize that is drought resistant and matures within a short time. This zone occupies Nyanza and parts of Rift Valley. It has significant immigration of the population from the high rainfall to medium rainfall zones. Also beef and dairy cattle are kept here. Sugar cane growing is cultivated but it takes 24 months to mature. This species can be improved by introducing a short term variety that takes twelve months to mature. The middle rainfall zone does not need a lot of cultivation since this can cause soil degradation.

The low rainfall zones is the ASAL and rainfall received is between 150 – 350 mm per year. It is home to 10% of the Kenyan population that is about 4 million (USAID, 2010). It has 80% of the country's livestock that is cattle, sheep and goats, camels and donkeys. Most of the livestock is indigenous and is drought resistant. The low rainfall also favours camels which are high grazers and 50% are in milk throughout the year. However, this region lacks sufficient infrastructure for its produce. It lacks livestock based abattoirs, milk and leather factories which could make the ASALs more productive than they are at present (USAID, 2010). The seasonality of rain contributes to the periodic nature of food insecurity for pastoralists and agro pastoralists and marginal agricultural farm households (USAID, 2010).

### 3. FAO system

Simple agro-ecological zones were established by FAO in 1981 (FAO, 1996). They are suited to make decisions in international and long term agricultural policy. In order to give advice to farmers in the districts a more differentiated system showing yield probabilities and risks as well had to be developed (FAO, 1996). FAO's ecological zones in Kenya can be classified into Tropical Alpine, Upper Highlands - UH, Lower Highlands - LH, Midlands which include Upper Midland - UM, Lower midland - LM. There is also the Lowlands that is the low altitude - L and Coastal lowlands - CL.

These zones are controlled by a mix of altitudes, rainfall and soil. The zone groups are temperate belts defined according to the maximum temperature limits within which the main crops can flourish; cashew and coconuts for the lowlands, sugarcane and cotton for the low midlands, Arabica coffee for the upper midlands (usually known as "Highlands" – the term "midlands" is used here to denote their central importance), tea for the low highlands and pyrethrum for the upper lands (FAO 1998).

The highest zone is high altitude rough grazing that is tropical alpine (or afro-alpine) vegetation. The threshold values of annual mean temperatures have been established along similar lines but supplemented by limiting factors or many crops for example mean minimum temperatures and frost. The main zones are based on their probability of meeting the temperature and water requirements of the main leading crops. The name of the main zones refers to potentially leading crops and many of them can be grown in other zones too.

#### **4. Zonation and food security**

Factors influencing zonation in Kenya are related to food security and can make Kenya to have food sovereignty and be food secure or not. However, with the current global warming and climate change there is need for adaptation. This adaptation can be in the areas of energy production and agriculture. The rising temperatures are associated with an increase in evaporation and may increase energy needs for irrigation in ASALs. Increased temperatures pose challenges for farmers and increase drought in the ASALs which can cause food insecurity.

Adaptations to climate change can be by introducing drought resistant crops and seeds that are better suited to the changing climatic conditions and breeding new plant species and crops that are more tolerant to changed climatic conditions. Agro pastoralists are more settled with permanent crop fields close to their homesteads largely to the land tenure systems. They also have large herds that act as food security (GOK 2004). ASALs are well endowed with stocks of natural capital in that it occupies 80% of the country's land mass which caters for a diverse range of flora and fauna. Although they receive low and erratic rainfall they have a comparative advantage for livestock and game production based on natural pasture (USAID, 2010).

Mango et.al (2009) observe that livestock diversification and commercialization in the ASALs, investing in new and /or different types of animals or shifting to production of new products is key to poverty reduction and food security.

The Kenya's ASALs also support about seven million people and more than 50% of the country's livestock population. These areas, which are also classified as rangelands, are unsuitable for rain fed cultivation due to physical limitations such as aridity and poor vegetation. These areas lack infrastructure to transport these livestock and have no slaughter houses. However, using new technology for agriculture for example irrigation and agricultural diversification, improving infrastructure, having bio enterprise development (Wren, 2008b) and having livestock markets can make the ASALs very productive thus contributing to the food security in Kenya.

Diversifying and improving livelihoods of their inhabitants in a way that reduces poverty in the long term and also to use natural resources in a more sustainable manner is vital to food security. Livelihood diversification initiatives in the ASAL of Kenya include bee keeping and growing of Aloe vera but it has been constrained due to poverty, inadequate infrastructure and poor services (Mango et . al 2009).

Biophysically, low rainfall amounts, high rainfall variability, high temperatures, aridity and droughts characterize the ASALs (Ogallo,1994), and climate change is expected to intensify these features of ASAL climate (Oba, 2001; Schreck and Semazzi, 2004; Christensen , 2007). In their interactions, these factors generally limit livelihood options. Extensive livestock grazing using highly adapted livestock remains the main livelihood option.

Poverty levels vary in the livelihood zones and the highest poverty level being in the pastoral livelihood zones. The poverty variability is determined by rainfall variability, length of growing period and elevation. Livelihoods can escape poverty by practicing crop diversification, crop commercialization where they shift from producing crops solely for home consumption to more commercial and market oriented crop enterprise, increasing land under cultivation and by crop intensification through improved management practices such as increased fertilizer use and /or the introduction of new crop varieties that are drought resistant and take a short time to mature in the high rainfall zones (Mango et al., 2009).

High potential cereals and dairy zones often known as Kenya's grain basket have had conflicts and displacement contributing to food insecurity (KFFSSG, 2008). On the other hand the North Eastern pastoralists have unfavourable terms of trade and food imports from Ethiopia which cause food insecurity. Also livestock raiding, clashes and violent conflicts over resources continually undermine the ASAL livelihood and wealth creation (GOK, 2004). Further, these armed conflicts are worsened by proliferation of small arms from neighbouring countries like Somali. More over the impact of drought caused by unpredictable weather leads to the death of livestock and humans and loss of crops. The severity of the dry season in this region leads to long periods of hunger thus exacerbating the food insecurity situation and dependence on relief food which is not sustainable.

## 5. Discussion

The review reveals that 80% of the country lies in the ASALs which experience different climatic conditions. This creates great challenges to food security in the land and therefore there is need to understand the challenges of the different zones by all stakeholders.

The review further shows that Kenya uses two systems in classifying ecological zones. The FAO classification that is generally used for tropics is suited to make decisions in international and long term agricultural policy. On the other hand there is the Kenya version which is older and only applicable in Kenya (Kenya soil Survey, 2010). This then means that Kenyan zonation version is limiting and divides Kenya into six agro-ecological zones, unlike the FAO system that is international and is applicable to the tropics. The Kenyan ecological zones version is best suited to give advice to farmers in districts since it shows yields probabilities and risks.

It is evidenced from the review that, the Kenyan zones are controlled by a mix of altitudes, rainfall, access to markets, geographical location and soil and each zone has its own limits that affects food security. It is therefore of great value to understand the limits of each zone due to climatic change and a rise in temperatures so as to adapt effectively to the changes. This can be done through introduction of drought resistant crops and seeds that are better suited to the changing climatic conditions Mango et al., (2009).

Diversification and commercialization in the ASALs can also help reduce food insecurity. Use of new technology, improving infrastructure and having ready markets can make the ASAL regions very productive.

Food security can be improved by use of properly laid out policies that will help identify ways of improving infrastructure and service delivery in the various zones and provisions of information on



the variety of crops that can be grown and the favourable terms of trade and food imports by the various stakeholders. With improved management practices, the natural resources can be used in a more sustainable manner which will in the long run increase food security.

## 6. Conclusion

Climate, soils, geographical location, access to markets and altitude influence zonation in Kenya. As much as these zonation factors may seem to be a limiting factor to some zones, the different zones can be improved to have high agricultural and livestock production. The ASALs can be developed so that range management is improved so as to contribute to the tourist industry which is Kenya's largest foreign currency earner and as a result boost the country's economy. Crop diversification and commercialization in agriculture, intensive farming, adaption to climate change and global warming, using modern and appropriate technology can make the zones more productive. The ASALs also have occasional conflicts amongst the different pastoralist communities over watering points, livestock raiding and other resources. These conflicts and displacements contribute to food insecurity. Deploying security officials and having peace can improve production in the ASALs. The ASALs which occupy 80 % of Kenya's land mass and have the least population with much land have great potential if they are allocated capital, developed and are given much attention.

## 7. Recommendations

Further research should be encouraged in the different zones to provide new knowledge on suitable crops and animals that can be sustained with the current climatic change conditions.

There is need to analyze the development of each zone in resource allocation so as to help come up with proper and sufficient infrastructure for the produce and access to markets.

Conflict mitigation and resolutions should be enhanced to reduce, displacements through deploying security officials. Long term strategic thinking and planning geared towards preventing conflicts and encouraging peace amongst the different communities which includes negotiations to resolve issues prior to conflict is vital.

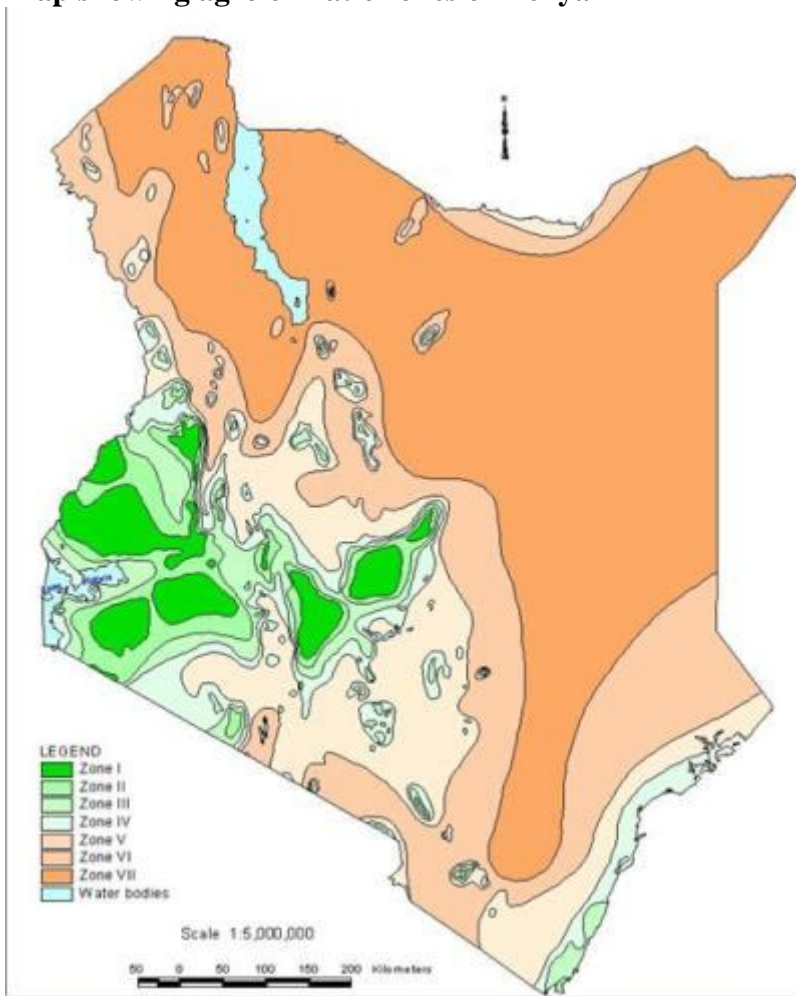
Much attention should be given to ASAL regions in addressing the issue of poverty, inadequate infrastructure and poor services to enable inhabitants use available natural resource in a more sustainable manner.

**Table: 1 Agro-ecological zones of Kenya**

Zone	Appr. Area (km <sup>2</sup> )	% Total
I. Agro-Alpine	800	0.1
II. High Potential	53,000	9.3
III. Medium Potential	53,000	9.3
IV. Semi-Arid	48,200	8.5
V. Arid	300,000	52.9
VI. Very arid	112,000	19.8
Rest (waters etc)	15600	2.6

Figure 1

Map showing agro climatic zones of Kenya



The agro-climatic zones of Kenya

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## References

Christensen, J.H. *et al* (2007). Regional climate projections. In: S. Solomon *et al* (eds.) *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, NY: Cambridge University Press, pp. 847–940.

European Journal of Development Research (2010). *The Struggle to Diversify Rural Livelihoods: Bio-enterprise Initiatives and their Impacts on Agro-Pastoralists and Pastoralists Communities in the Drylands of Kenya Vol:22, 751–769*. doi:10.1057/ejdr.2010.42; Published online 23 September 2010 . Retrieved from: <http://www.palgrave-journals.com/ejdr/journal/v22/n5/full/ejdr201042a.html> retrieved on 2/4/2011

FAO (1996). Agro-ecological Zoning Guidelines. FAO Soils Bulletin 73. Retrieved from [www.fao.org](http://www.fao.org) on 2/4/2011

Government of Kenya (2004). Draft National Policy for Sustainable development of Arid and Semi Arid lands of Kenya.

Kenya food Security Steering groups ( 2008). The Impact of rising food prices on disparate livelihoods groups in Kenya.

Lawrence, M. King A. and Holt ,J (2011). The practitioners guide to HEA retrieved on 22/5/2011 from: <http://www.feg-consulting.com/resource/practitioners-guide-to-hea/2%20Livelihood%20Zoning.pdf>

Mango N, Kristjanson P, Krishna A, Radeny M, Omolo A and Arunga M. 2009. *Why is it some households fall into poverty at the same time others are escaping poverty? Evidence from Kenya*. Discussion Paper No. 16. ILRI (International Livestock Research Institute), Nairobi. Ministry of Agriculture, Republic of Kenya. Strategy for Revitalization of Agriculture (SRA). Strategy for Revitalizing Agriculture ( SRA) (2004) . Retrieved from: [www.africaforum.info/.../9AFD1Pres6OngwaeStrategyforRevitalisingAgricultureinKenya.zip](http://www.africaforum.info/.../9AFD1Pres6OngwaeStrategyforRevitalisingAgricultureinKenya.zip) on 22/5/2011

Ogallo, L.J. (1994). Interannual Variability of the East African Monsoon Wind Systems and Their Impact on East African Climate. WMO/TD 619:99–104.

Oba, G. (2001). The importance of pastoralists' indigenous coping strategies for planning drought management in the arid zone of Kenya. *Nomadic Peoples* 5: 89–119.

Schreck, C. and Semazzi, F. (2004). Variability of the recent climate of Eastern Africa. *International Journal of Climatology* 24(6): 681–701.

Sombroek, W.G., Braun, H.M.H. and van der Pouw, B.J.A. (1982). Exploratory Soil Map and Agro-Climatic Zone Map of Kenya, 1980. Scale: 1:1'000'000. Exploratory Soil Survey Report No. E1.

Kenya Soil Survey Ministry of Agriculture - National Agricultural Laboratories, Nairobi, Kenya.

Retrieved from:

<http://www.infonet-biovision.org/default/ct/690/agrozones> on 15/5/2011

USAID (2010). Strategic Review. Feed the future. Retrieved

from: <http://docs.google.com/viewer?a=v&q=cache:DVZ3bj1j9k4J:www.feedthefuture.gov/documents/KenyaFTFStrategicReview.pdf+High+Rainfal+zones+in+kenya&hl=en&gl=ke&pid=bl&srcid=ADGEESgo2O0fVJewrKPGuIuWXfdiwsWP8MA7aUshW3DWA8EbVARpL1ba8jfx2vh0rIXzu62IsvDrhrUj>

[C5PnZ4hzgu3H4BG8NbeQYaQ7wD4EuFHuDYINzy0BNGa5k50I3\\_9nV\\_asL3FY&sig=AHIEtbSmq0Jzy662GRUFAbcXhB2nOFR0JQ](http://docs.google.com/viewer?a=v&q=cache:DVZ3bj1j9k4J:www.feedthefuture.gov/documents/KenyaFTFStrategicReview.pdf+High+Rainfal+zones+in+kenya&hl=en&gl=ke&pid=bl&srcid=ADGEESgo2O0fVJewrKPGuIuWXfdiwsWP8MA7aUshW3DWA8EbVARpL1ba8jfx2vh0rIXzu62IsvDrhrUj) on 22/5/2011.

Wren, S.A. (2008a). Bio-enterprise development for pastoral communities in the ASAL-HECA. Oxfam GB, OXGB03-07. Nairobi. Kenya.

Wren, S.A. (2008b). Scale-Up of Existing Aloe-based Business in Laikipia. Kenya: Laikipia Wildlife Forum